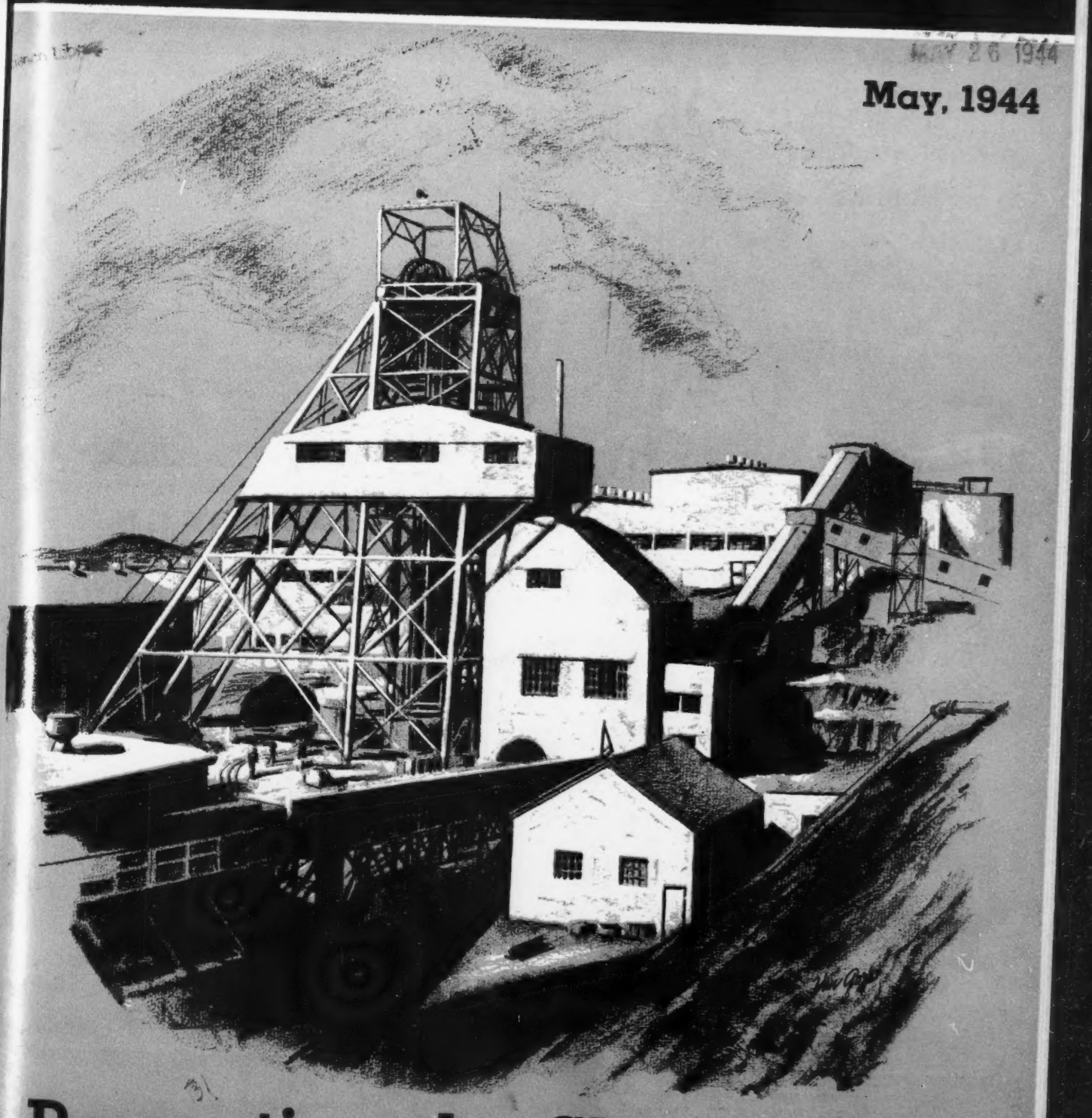
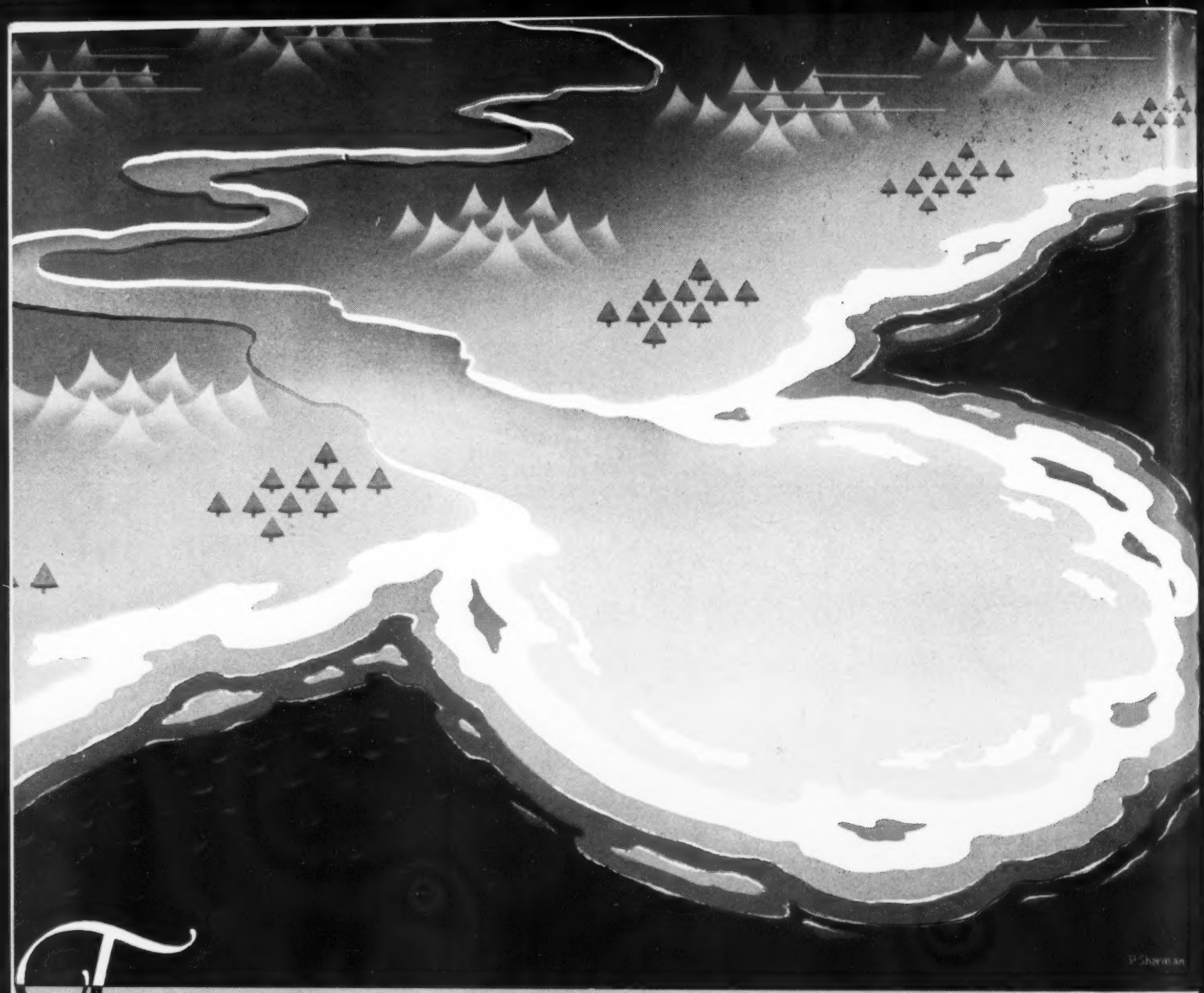
ENGINEERING AND MINING JOURNAL

MAY 26 1944

May, 1944



Presenting the Shuttle Car



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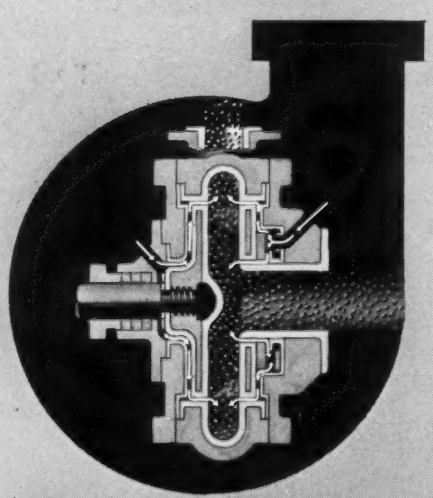

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ENGINEERING AND MINING JOURNAL

ALFRED M. STAEHLE, Publisher — H. C. PARMELEE, Editor

New York: A. H. Hubbell, Managing Editor; Evan Just, Robert H. Ramsey, Associate Editors; H. H. Wanders, Market Editor; W. N. P. Reed, Assistant Editor. *San Francisco:* J. B. Huttl, Associate Editor; G. J. Young, Consultant. *Washington, D. C.:* Paul Wooton.

Volume 145 — **MAY, 1944** — Number 5

Editorials 59

Presenting the Shuttle Car
- Three Years of Shuttle Cars at International's Potash Mine ..... G. T. HARLEY 62
- Potash Co. of America Uses Battery Shuttle Cars ..... RUSSELL G. HAWORTH 65

Profits for Hecla from 40-Year-Old Tailings ..... W. L. ZEIGLER 68

How to Operate a Flotation Machine ..... ROBERT H. RAMSEY 72

Wear-Resistant Castings Cut Maintenance Cost ..... ROBERT McINTOSH 76

Giant Dragline Projected for Florida Phosphate Field 79

Iron Ore Briquetting Process Patented 79

How the Rhodesian Coppers Were Found ..... RAYMOND BROOKS 80

What Tripper Speed for Uniform Spilling? ..... R. F. EMERSON 84

Photography for Improving Drill-Core Records ..... CHARLES A. DOBBEL 86

Operating Ideas 88

Conveyor Cleaner Also Returns Materials to Belt * A Jones Riffle for Sampling Wet Pulps * Belt-Drive Guards Prove Easy to Build * Safety Switch for Starting Rotary Converters

Market Summary 90
Washington News 92
News of the Industry 94
Book Reviews 96
Personal Items 97
Obituaries 100
Regional News 102
Equipment News 138

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Publication Office: 99-129 N. Broadway, Albany, N. Y.
Editorial and Executive Offices: 330 West 42nd Street, New York 18, N. Y.
Cable Address: McGraw-Hill, New York

Branch Offices: San Francisco 4, 68 Post St.; Chicago, 520 N. Michigan Ave.; Los Angeles, Calif., 601 Fifth St.; Washington, D. C., National Press Building; Pittsburgh, Pa., 738-9 Oliver Building

District Managers: New York, T. E. Alcorn, F. W. Roets; Philadelphia, J. F. Cleary, W. A. Potter; Cleveland, W. M. Spears; Detroit, W. S. Drake; Chicago, S. J. Alling; St. Louis, R. Y. Fuller; San Francisco, J. W. Otterson.

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Aldwych House, Aldwych, London, W. C. 2, England
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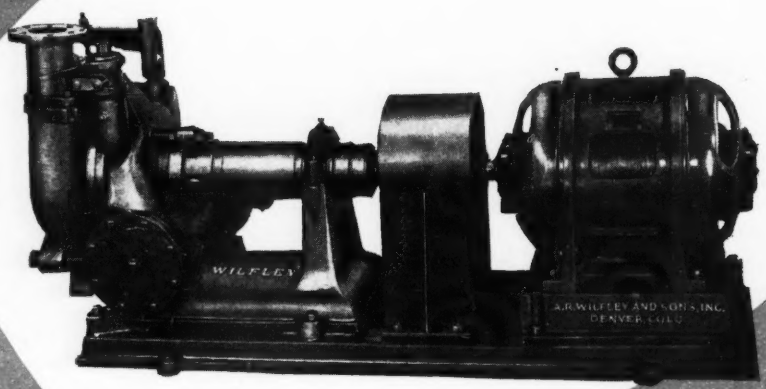

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ENGINEERING AND MINING JOURNAL

H. C. Parmelee, Editor

What Constitutes Discovery?

RECENT ACTION of the General Land Office in contesting certain unpatented mining locations in a Montana Grazing District, particularly in declaring one group of claims therein to be null and void, points to some aspects of the mining law that may not be clearly understood. Adverse proceedings in this case were instituted by the G. L. O. on the ground that the locations were invalid for want of discovery. Naturally, questions arise as to (1) what constitutes adequate mineral discovery; and (2) the right of the federal government to challenge the validity of mining locations within the public domain.

Reference to Ricketts' American Mining Law shows that discovery has been the subject of numerous court decisions, more than one hundred of which are there cited. Discovery is essential, and a condition precedent, to location. In a lode location mineral must be found in place; mere indications are inadequate and the presence of float is not sufficient. Discovery must not be imaginary, and evidence must be sufficient to justify prudent expenditure of labor and money with reasonable hope of developing a mine. In short, the courts have repeatedly affirmed and supported the provision in the mining law that "no location of a mining claim shall be made until the discovery of the vein or lode within the limits of the claim located."

Once a valid mining location has been made, however,—that is, one based on discovery of mineral as legally defined—the claimant is secure in his rights. The General Land Office is authority for the opinion that, under such conditions, "the right of the locator as against the world, including the United States, to the possession of the claim for mining purposes depends only on the condition that he perform annual assessment work on the claim of the value of $100 or, failing to do so, that he resume work before a relocation of the claim is made."

As to the second question, according to the G. L. O., the federal government has long exercised the right to challenge the validity of mining locations on the public domain where the interests of the government are involved, as in forest reserves and grazing districts. Here the G. L. O. claims jurisdiction for the purpose of determining the character of the land located under the mining law, and the courts have sustained the right of the government to proceed against and declare such locations invalid. The right is exercised only where a contest is initiated by an individual or where a conflict occurs with another governmental agency. This general exposition of the matter is offered in the interest of claim holders, who should be diligent in defending their locations against any charge of invalidity.

Self-Sufficiency in Zinc?

AT THE RECENT EXCELLENT MEETING of the American Zinc Institute in St. Louis a prominent Western mine operator challenged the view expressed by T. H. Miller, of the United States Bureau of Mines, that we can no longer look forward to self-sufficiency in zinc (see p. 94). This operator expressed the belief that self-sufficiency can be maintained for the future at a price of seven to nine cents per pound.

If the belief of this operator can be sustained by convincing data, it is of the utmost importance to domestic zinc producers that these data should be collected and be available for presentation when national policy on imports is formulated. Probably the problem will be on us suddenly when it comes, so now is the time to be assembling the domestic industry's case for tariff protection or an equivalent subsidy to oppose the advocates of greatly increased dependence on imports.

To help domestic producers assemble and present their case, *E.&M.J.* will be glad to receive data in confidence from operators or other qualified parties, which

it can compile into a coherent general picture. Or we shall be pleased to publish a general article by a qualified person who can secure access to the necessary data.

In a nutshell, the questions to be answered are: (1) Where are the domestic deposits that can sustain a production of 600,000 tons of metal per year? (2) What metal price will it take to bring it out (a) at present wage rates, (b) at 1940 wage rates? (3) For how many years can the given price be expected to yield this rate of production?

Labor's Stake in Reconversion

IN THE PUBLICITY on reconversion of industry back to peacetime pursuits, and on the postwar continuation of marginal mineral production, it seems to us that too little attention has been paid to the stake of labor in these matters. Without detracting one whit from the arguments justifying the return of capital from war enterprises, one can also stress the problems of the workmen whose livings are tied up in the same enterprises. In fact, any modern analysis of this situation will recognize that the rights of labor and capital-management should each have great weight. Also important is the circumstance that no logical view can assume that the stake of capital-management is divorceable from that of labor.

If we are to have peace and progress in this country, including the much-heard "full employment," it is essential that both labor and management must recognize that neither gains by pulling the house down on the other, or for that matter on any important element of society. The stake that both have in the creation of reasonably full employment after the war and in preventing the government from swallowing up industry is so transcendent that it should provoke considerable willingness of each party to see the other's viewpoint.

Drift Toward Controlled Economy

IT IS CERTAINLY NOT TRUE that our British and Canadian contemporaries are any more inclined toward socialism than we are. Consequently it is interesting to observe that whereas we are supporting unrestrained private enterprise and free flow of trade, the British are expecting to control their domestic economy and channel international trade on a greater scale than ever. As a matter of fact the program which the British are contemplating bears a striking similarity to the system of cartel agreements and blocked exchanges set up by Germany before the war.

While we are denouncing controlled economy and barriers to trade, even our good Canadian neighbors are thinking in other terms. At the recent annual meeting of the Canadian Institute of Mining and Metallurgy, Professor George B. Langford proposed a scheme for international control of mineral production that would be breath-taking if it were not thoroughly in line with Article Four of the Atlantic Charter. This article states, "They will endeavor, with due respect for their existing obligations, to further the enjoyment by all States, great or small, victor or vanquished, of access, on equal terms, to the trade and to the raw materials of the world which are needed for their economic prosperity."

Citing the unconservational results of hard times, Professor Langford urges the prevention of mineral waste by avoiding depressions in the mineral industry. This is to be accomplished by fixing mineral prices at comfortably high levels, such as has been customary for gold. Economic producers, who would enjoy handsome profits under such an umbrella, are to be relieved of their surplus gains through excess-profit taxation. A comprehensive study of productive capacities and world consumer requirements is to be made, in the light of which production is to be controlled and supplies are delivered to consumers. In other words, the plan calls for a giant international mineral cartel, to fix prices, allocate production, and control the flow to markets. Buffer stockpiles and preventing belligerently inclined nations from securing excess mineral supplies would be incidental to this scheme.

Rather than to accuse our British cousins of selling private enterprise down the river, it might be worth while to ask ourselves soberly what kind of a world we are headed for after the war, and to what extent our expressed policies fit this prospect. The British are moved in the direction of control by fear of unemployment and depression. The former can wreck any social order and, with a colossal national debt, the latter can wreck any economic order. Have we developed adequate protection against these dangers? If not, does the solution lie in more freedom or more control?

Progress in the War with Silicosis

ALUMINUM, in powder form, may now be said to be definitely established as a harmless means for preventing silicosis in human beings and for ameliorating the symptoms where this dust disease has already gained a start. This encouragement for all affected with or exposed to the disease, and for the operators of mines and plants where silica dust is a hazard, was expressed by Dr. W. D. Robson, medical director for McIntyre Research,

Ltd., at the recent Toronto meeting of the Canadian Institute of Mining and Metallurgy, in a symposium on aluminum therapy. With equal emphasis Dr. Robson declared that such use of aluminum powder is not a cure for silicosis nor a substitute for adequate dust control.

With the late J. J. Denny, Dr. Robson participated in the determination of this important property of aluminum. His findings in the present instance are supported by and reflected in the report of the work done at the independent clinic conducted at St. Mary's Hospital in Timmins, Ont., by Drs. Crombie and Blaisdell, of the Queen Alexandra Sanatorium at London, Ont.

Paralleling these studies, the results of which have now been announced, is the long series of experiments conducted at McIntyre mine by A. W. Jacob to determine the most effective way of treating miners with aluminum to prevent the disease and retard its progress. The outcome is the development of a technique for the prophylactic treatment of the men *en masse* at the start of the shift by introducing a definite dosage of aluminum powder, properly prepared, into the air of the tightly-sealed change house while they are donning their clothes. This preventive practice is proving effective.

Manpower Cuts into Production

MANPOWER easily looms as the major problem confronting producers of metals and minerals as the war enters its crucial stage. The War Manpower Commission recently listed copper, zinc, lead, molybdenum, barite, and strategic sheet mica as commodities facing a labor situation that may become serious later this year. So far, all essential requirements for war materials have been met, and, in most instances, comfortable emergency reserves have been accumulated to meet contingencies.

But from this point onward, it is apparent that labor shortages will become more embarrassing, unless a favorable turn in the fortunes of war brings about a downward trend in consumption. The shortage of experienced mine workers kept 1943 production from increasing to a greater extent than the record of that year indicates, and last year established high marks for almost everything. Since March of the current year, the Army has become far more insistent in providing for its own revised manpower needs, and relief measures can no longer be expected to bolster operations at the mines, smelters, and refineries.

WPB has revealed that it hopes to obtain a supply of 1,739,000 tons of new copper for the 1944 war program. Of this huge total, about 1,200,000 tons will have to come from domestic sources. Should domestic output suffer, reserves now in the hands of the government are certain to shrink. Zinc experts look for production of zinc to decline from 10 to 15 percent over the remainder of the year, and the drop in output will also bring with it rising costs. The situation in lead about parallels that of zinc, except that we are so situated that importations from Mexico can supplement home production.

Military leaders must be thoroughly conversant with the demand-supply position of critical metals and minerals, and in taking a strong stand on manpower requirements they undoubtedly feel that their problem is the more urgent of the two.

The Gas Turbine, Simplest Prime Mover

A PRIME MOVER unknown to the mining industry today so far as any application of it is concerned, the gas turbine offers possibilities for tomorrow's mining. It is still in the early stages of its development, however, and no one can predict with certainty how extensive will be the use it will find eventually. It has been styled by engineers the most promising source of mechanical power and as having the simplest power cycle known. At the same time, this is coupled with a word of caution against over-optimism. Any wide adoption is bound to be deferred until after the war.

What the steam turbine has been to the steam engine, in respect to inherent advantages, the gas turbine is to the reciprocating internal-combustion engine. The gas-expansion cycle, which once was practical only in the latter's cylinders, now can be used in the turbine, converting fuel energy directly to power on a rotating shaft. Thus the reciprocating mechanism becomes unnecessary and the difficulties of injecting fuel, of lubricating hot, sliding surfaces, and of using cooling water have all been done away with. Compared with the conventional steam system, also, the gas cycle offers advantages.

The basic idea of the gas turbine is old, but early efforts to put it to use met with failure, partly because of the lack of materials able to withstand the high temperatures that are necessary if the turbine is to work efficiently. Research in metallurgy and aerodynamics, some of it under wartime pressure, is said to have solved these and other difficulties, and the store of knowledge meanwhile accumulated about the steam turbine has also helped.

Current use of the gas turbine is limited largely, if not wholly, to the petroleum refining and aircraft industries. Before this use is likely to be widened greatly, the high-grade fuel oils now burned must yield to low-grade oils and coal. Further research will be entailed by the problems involved. So optimism should indeed be restrained. Nevertheless, this prime mover can advisedly be kept in mind.

Presenting the SHUTTLE

Three Years of Shuttle Cars at International's Potash Mine

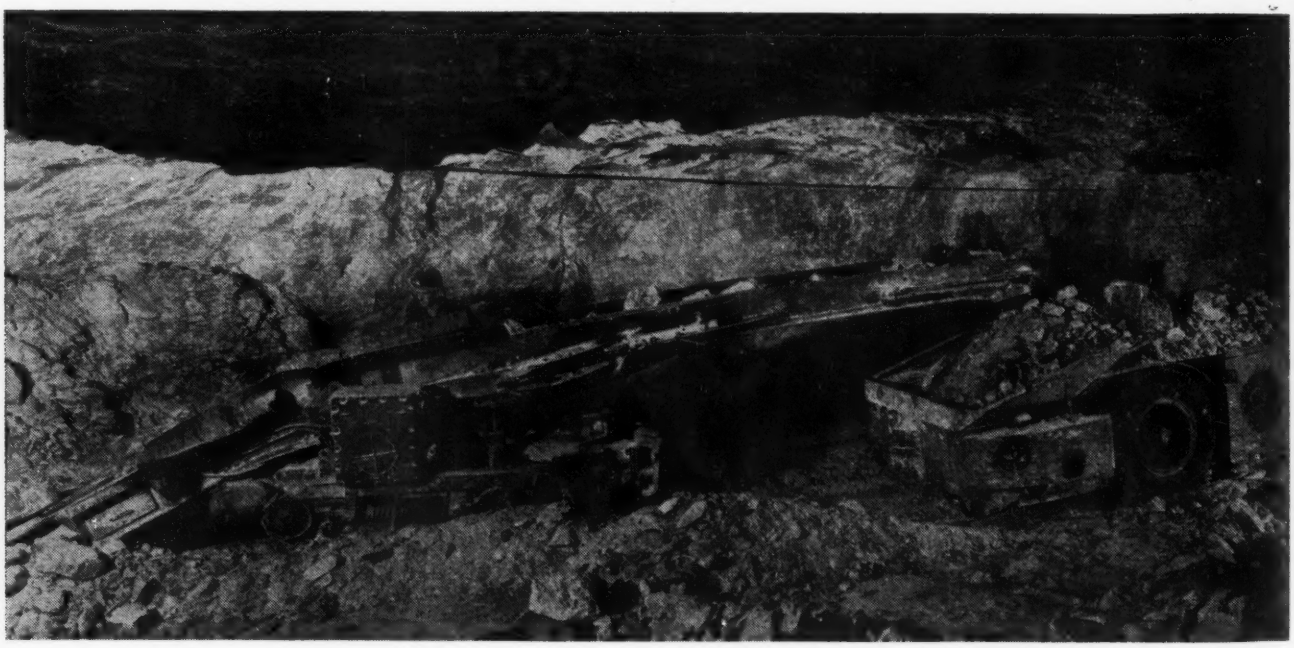
G. T. HARLEY, *Assistant Manager, International Minerals & Chemical Corporation, Carlsbad, N. M.*

INTERNATIONAL Minerals & Chemical Corporation has used shuttle cars in its potash mine at Carlsbad, N. M., since it began producing langbeinite and sylvite-bearing ores late in 1940. The langbeinite comes from the 800 level, from the only known commercial deposit worked in this country. Sylvinite, the ore containing sylvite with a gangue of salt, is mined from a lower bed at a depth of 900 ft.

On the 800 level, mining is proceeding near the main hoisting shaft and was started with 11BU Joy loading machines and Joy shuttle cars. The latter are rubber-tired and operate on a double-trolley-wire system without tracks, being equipped with trolley poles and cable reels. This was believed to be the first installation of its kind at the time, and the first of shuttle cars for handling material other than coal. The cars shuttled back and forth, without turning, between the loading machine at the face and an ore raise at the shaft. The illustrations show them at various steps in the operation today.

Trolley wire is extended only in main entries and in panel entries, and the cars move up to the faces by means of 600 ft. of trailing cable held on the reel. The photograph on page 64, which shows the trailing cable being attached to the trolley system, also illustrates the excellent condition of the roadbed. The roadway is maintained by spreading "bug dust" obtained from undercutting, and sprinkling with water. At intervals it is leveled by dragging a scraper behind the cars to fill in ruts and depressions. The surface, thus treated, sets up and becomes as hard and smooth, and nearly as durable, as asphalt pavement.

As mining has advanced away from the main shaft, raises have been driven from the main haulage road on the



AN 8-TON, 4-WHEELED SHUTTLE CAR, equipped with a bottom conveyor, takes its load from a caterpillar-mounted loading machine in one of the rooms in International's potash mine. The conveyor in the bottom moves the load forward as received. The ore weighs 155 lb. per cubic foot in the solid

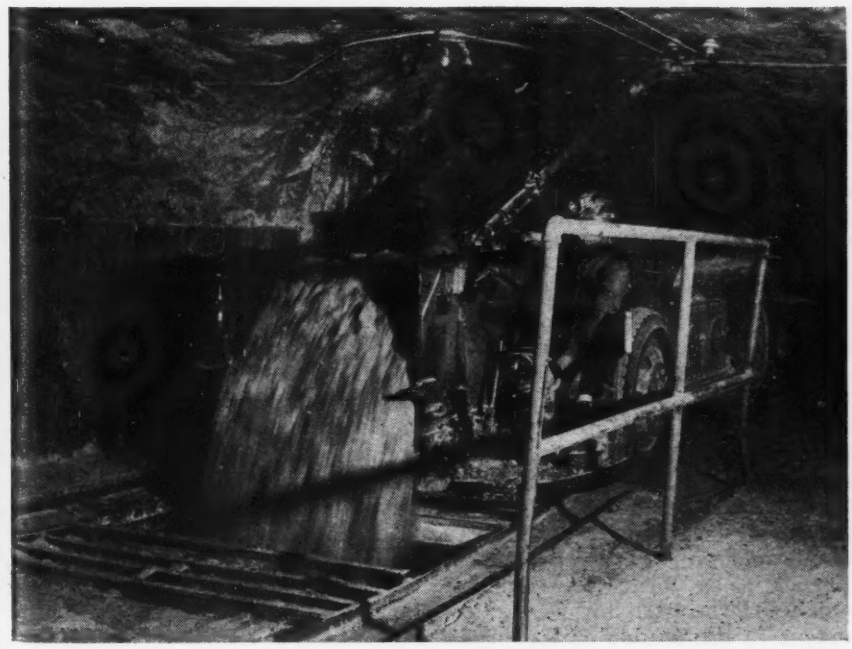
CAR *A survey of current practice*

COMBINING the functions of hauling and carrying in one unit, the modern rubber-tired shuttle car offers, for those ores and working conditions to which it is adapted, a means of transport that is characterized by mobility, simplicity, and low operating cost per ton. Just as the truck has invaded the field of open-pit transport in recent years, the shuttle car is finding acceptance, though as yet a limited one, in underground mines, thus far mainly non-metallic but with possibilities in metal mines remaining to be further explored. No great imagination is required to conceive of new applications, especially where new mines or mining areas are being opened.

Summaries are presented here of the up-to-date practice with shuttle cars in mines of two operators in the Carlsbad potash region of New Mexico. One of these — International Minerals & Chemical Corporation — pioneered with this type of haulage, being the first mining company to use it outside of the coal industry. Since the first installation, its use of these cars has increased. The other operator is the neighboring Potash Company of America. In following issues other installations will be discussed.

900 level to corresponding points on the main entry of the 800 level, which is directly over the one below. From these raises on the 800 level the shuttle cars travel through panel entries on trolley wire, and then on cable reel, to the mining faces.

Length of haul has increased, and at times the shuttle cars are called upon to travel as much as 2,200 ft. with the load. To avoid loss of loading time due to this longer haul, three or four cars operate behind one loading machine, instead of the original two-car installation which was deemed sufficient with shorter hauls. With hauls at 600 to 700 ft. and under, a loading machine served by three shuttle cars will load at the rate of 200 tons per hour when the heading is full and loading conditions are at their best. Cleaning up at the end of the round, entering new faces, and moving from one area to another make the rate lower for a full eight-hour shift, but shift tonnages as high as 1,100 have been maintained. At a distance of 2,200 ft., and with four shuttle cars behind the loader, a maximum loading rate of 112 tons per hour has been maintained, and shift loadings have been as high as 620 tons.

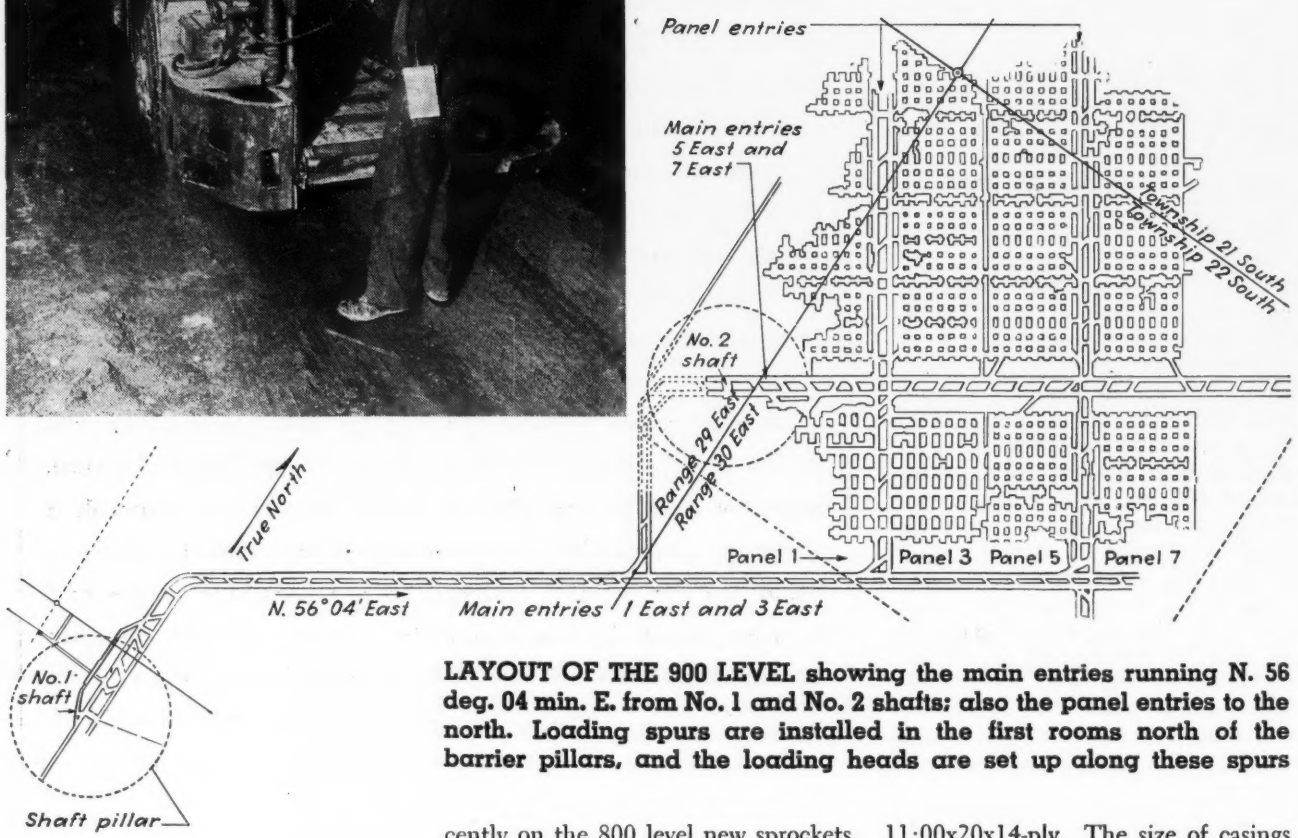


DUMPING into an ore raise. Note the two-wire trolley system overhead. The car is also equipped with a reel carrying 600 ft. of trailing cable for leaving the trolley line to enter the rooms

On the 900 level, the original practice was to load the sylvinite with Joy machines directly into mine cars for haulage to the shaft. In January, 1943, after over two years' experience with the trolley-cable reel shuttle cars on the 800 level, five storage-battery cars were installed on the 900 level. Present practice is to load into these cars and haul the ore 600 ft. or less to a loading head, which transfers the ore into mine cars to be hauled to the shaft. An illustration shows a shuttle car dumping into a loading head. Operation of the latter and signals to the motorman are controlled through two pushbuttons on a flexible cable by the nipper.

The general layout of the 900 level is shown in a drawing. Main-line tracks are installed in the main entries off No. 1 and No. 2 shafts, and in the

ATTACHING THE TRAILING CABLE to the overhead trolley system in the entry by means of the nips in order to go into the rooms for loading. The bottom conveyor can be seen. Note the excellent roadway, surfaced with "bug dust" and maintained by scraping and sprinkling



LAYOUT OF THE 900 LEVEL showing the main entries running N. 56 deg. 04 min. E. from No. 1 and No. 2 shafts; also the panel entries to the north. Loading spurs are installed in the first rooms north of the barrier pillars, and the loading heads are set up along these spurs

panel entries to the north. Loading spurs are installed in the first rooms north of the barrier pillars which extend across the panels at 385-ft. intervals and the loading heads are set up along these spurs. Thus there is no need for the shuttle cars to leave the room section between any two barrier pillars until the entire subsection has been worked out. Shuttle-car haulage distances are held to an average of less than 600 ft. at all times.

Shuttle cars used on both levels are of Joy make, Type 42 D. They measure 20 ft. in over-all length and are 7 ft. 5 in. wide and 49 in. high. The effective car body is 20 ft. long, 42 in. wide, and 33 in. high, except at the loading end, where the body is flared to the full width of the car and is lower, to avoid spillage when loading. Cars on both levels are loaded to just over 7 tons, the load being kept at this weight on account of wheel and tire design and because of speeds.

The speed of the cars as originally received was 3 m.p.h. under load and 3½ m.p.h. on the return empty. Recently on the 800 level new sprockets were installed which permit 4 m.p.h. loaded and 4½ m.p.h. empty. All cars are driven through the two rear wheels by two 7½-hp. motors, each connected to a wheel through chain and sprocket. The unloading conveyor is driven by a third 7½-hp. motor, and the cable reels of the cars on the 800 level are actuated by a fourth, smaller motor. All motors, batteries, cable reels, controls, and chain drives are mounted along the sides of the cars, and are protected from spillage, shock, and dust by housings and cover plates.

Car wheels were made by Budd, the front ones being Type 7-33V, 20 in. in diameter with a 9-in. tread, and the rear wheels Type 8-37V, 20 in. in diameter and of 11-in. tread. Because of the wide tread on the rear wheels, it was deemed advisable, before they were placed on the cars, to weld a stiffener flange plate between the spokes and the tread to give greater support to the outside of the tread. All casings are Goodyear Hard Rock Lug-type tires, the front wheels being equipped with 9:00x20x12-ply casings and the rear wheels with 11:00x20x14-ply. The size of casings used is based on the following approximate total weight: Cable-reel car, weight 13,000 lb.; load, 14,000 lb.; total weight, 27,000 lb.; battery-car average: weight, 11,600 lb.; batteries, 4,400 lb.; load, 14,000 lb.; total, 30,000 lb. distributed, 40 percent on front casings and 60 percent on rear casings. Tire pressures are kept at 90 to 95 lb. in the front casings and 105 to 110 lb. in the rear.

At the charging stations on the 900 level there is an overhead beam with crawl and chain block, with battery racks on the sides and a runway through the center. Charging equipment comprises a four-circuit battery unit and motor-generator set made by Electric Products Co. The cars enter between the racks, and a battery can be changed in five minutes. Cars normally operate a full shift on one battery change, but under severe conditions, such as adverse grades, it may be advisable to change at half-shift intervals. The stations are in the operating areas, so that the change can be made during lunch if required.

All repairs are in the nature of pre-

DUMPING SHUTTLE CAR, at right, into a loading head and thence into mine cars which are pushed one by one under the head by the trolley locomotive. The operation of the loading-head and the signals to the motorman are controlled by the nipper opposite through pushbuttons on a flexible cable

ventive maintenance. Minor repairs, inspection, and lubrication are effected in the working areas. Mechanical and electrical shops are maintained on each level, to which equipment is brought for major repairs and overhauls. Mechanics and electricians are on duty on three shifts. Service men carry tools and lubricating equipment between working areas on specially built rubber-tired or track-mounted trucks. Equipment is inspected at the end of each shift.

On the 800 level, the shuttle cars are used to transport rubber-tired drill trucks from one face to the next between loading cycles. A rubber-tired truck is on order for rapid transport of the loading machines over long distances. This will also be pulled by a shuttle car. On the 900 level a track truck has been built, on to which a shuttle car may be driven over a ramp to be transported long distances by a motor, both to save time and to avoid damaging casings in passing over tracks.

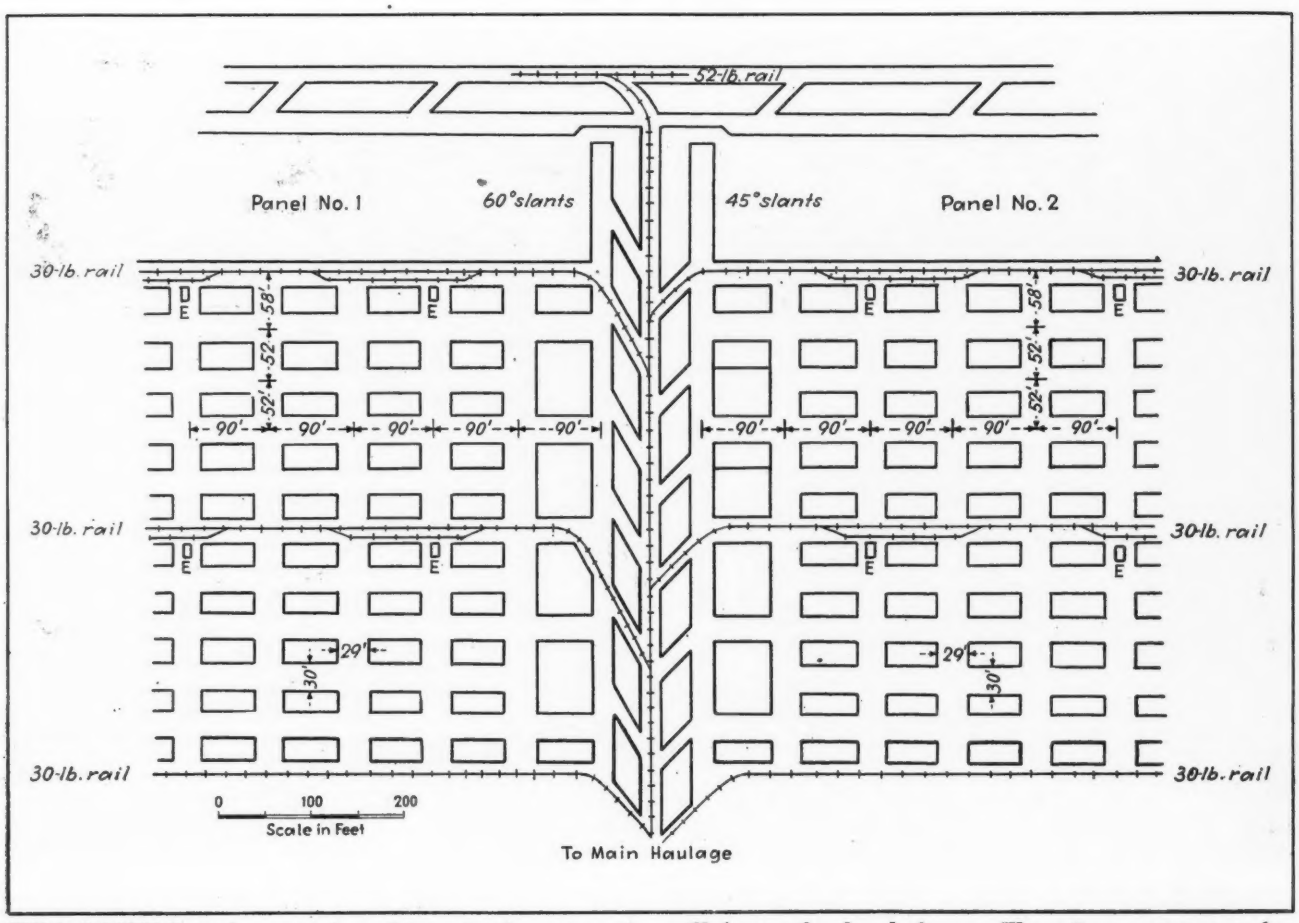
Louis Ware, president of International, and his staff are credited with having brought this new mine into production in remarkably rapid time, in 1940, at a moment when foreign supplies of potash were again cut off. Since then, the Union Potash & Chemical Corporation, the operating subsidiary at that time, has been merged into the parent company as its potash division, which is supervised by James P. Margeson, Jr., vice president. James A. Barr, located in Chicago, is the company's chief engineer. Harold S. Martin is manager for the company at Carlsbad.

Potash Co. of America Uses Battery Shuttle Cars

RUSSELL G. HAWORTH, *Mine Superintendent, Potash Co. of America, Carlsbad, N. M.*

THE POTASH DEPOSIT that is being worked by Potash Co. of America, near Carlsbad, N. M., consists of a mixture of halite and sylvite in a generally horizontal bed which averages somewhat under 6 ft. in thickness. It is roughly bowl-shaped, with numerous rolls in some areas. Coal-mining equipment has been found adaptable to operations with some limitations.

The first shuttle car was placed in operation in December, 1941, and a second unit in August, 1942. These, in conjunction with caterpillar-mounted loading machines, replaced



TWO PANELS, in layout of workings in the mine of Potash Co. of America, in the Carlsbad area. Extraction proceeds up the dip of the bed so that the grade will favor the loaded car. Elevating conveyors for loading the mine cars are placed at 270-ft. intervals in the breakthroughs. These are indicated by E

track-mounted loaders and cars in most extraction panels. Loading in development headings, however, is done with track-mounted loaders.

A room-and-pillar mining method is used. Pillar dimensions are 22x60 ft. Rooms are 30 ft. in width, breakthroughs 29 ft. Development consists, in general, of driving triple entries on four sides of a panel. The layout of two panels is shown in a sketch. Barrier pillars are left on the east and west sides of the panels and chain pillars on the north and south sides. Panel sizes vary according to local conditions, but panels now being developed are 2,000x1,100 ft.

Two rooms with breakthroughs are driven along the barrier pillar with the lowest elevation. Extraction then proceeds up the dip of the bed to provide a grade favoring the loaded shuttle car. Track with sidings for empties is left in the room adjacent to the barrier pillar and elevating conveyors are placed at 270-ft. intervals in breakthroughs.

All rooms subsequently used for track haulage as the panel advances are brushed to a minimum height of 8½ ft. for trolley lines. Tracks are placed usually in every fifth room.

A list of equipment used in each unit includes:

1 Loading machine—Joy Type 11 BU-8G
2 Shuttle cars—Joy Type 42 D9
2 Battery chargers—Joy Type
3 Elevating conveyors—Joy Type PL 11-7RG
2 Caterpillar mining-machine trucks—Joy Type T1-1G
2 Undercutters—Sullivan Type 7B
4 Electric drills—Jeffrey Type A6
8 Universal blower fans—Jeffrey Type 2½
2 2300V/220V air-cooled transformers—Westinghouse Type ASL
2 Trolley-reel locomotives—Baldwin 8-ton

The crew consists of:

1 face boss
1 loader operator and helper
2 shuttle-car operators
2 motormen and helpers
2 undercutter operators and helpers
4 drillers
1 mechanic electrician
1 shot firer

The cycle of operations starts with undercutting in the salt on the lower contact of the bed, followed by drilling, blasting, and loading. All operations have been carried out on the first two shifts of the day and blasting is done on the night shift when no other men are working in the panel. Continuous operation is now being scheduled.

Factors affecting haulage operations are investigated through time studies and daily operation records. Loading-machine capacity can never be fully utilized, but delays are minimized whenever possible. It has been found that it is not economical to carry the face more than 300 ft. beyond the elevating conveyors and track. Tracks are usually spaced at 260-ft. intervals. Haulage parallel to the track averages approximately 70 ft. It is possible to increase track spacing by operating a third shuttle car on longer hauls. When close to the elevating conveyor, a third shuttle car is of little or no advantage.

Track spacing is also dependent on the speed at which shuttle cars can be operated. It was soon evident that

SHUTTLE CAR powered with a storage battery on its way to dump its 8-ton load in Potash Company's mine. A standby shuttle car is used for hauling drills, on long moves; also for transporting explosives

higher speeds are not practical, maintenance costs increasing rapidly.

Delays at the loading machine due to repair of equipment have been somewhat reduced by using a third shuttle car as a standby unit to insure more continuous haulage from the loader to the face. One loading machine is used as a standby unit for both panels. A special truck has been built for hauling the loader. Small ramps are built at each panel for loading and unloading it quickly.

Ramps are substituted for elevating conveyors where the bed slopes downward to the track at the loading point. Discharge of ore from the shuttle car requires less time at a ramp than at an elevating conveyor, and there is practically no maintenance. Building of ramps more than 20 or 30 ft. in length is not practical, as the man-shifts required are greater than those saved. Ramps are constructed by shooting down enough salt for the proper grade and clearance for the shuttle car. A cribbing made from old track ties is built at the track. The salt pile is covered with 3x12-in. planking for traction.

Considerable care is taken in each new panel to lay out sidings and haulage routes to insure an adequate supply of empty cars.

Most of the equipment used was designed for the coal industry, but it has been found readily adaptable to salt. The higher specific gravity and hardness of the ore put greater strain on the equipment than when used in coal. Some changes were required.

Tires first used on the shuttle cars were not satisfactory. There were many blowouts due to heavy loading, approximately 8 tons per shuttle car. From 7.50x20, 12 ply, the front tires were changed to 9.00x20, 16 ply. Size and ply of rear tires were increased from 9.00x20, 12 ply, to 11,00x20, 14 or 16 ply. The oldest of the larger tires have been in service now for approximately six months. There have been no blowouts.

The standby shuttle car is used for hauling drills on long moves and for transportation of explosives.

It is possible to mine ore only 4 ft. thick by brushing an additional foot of salt from the back after the ore has been loaded out. The salt thus broken is loaded into a shuttle car, which is driven back to a worked-out area and dumped. It is sometimes necessary to cut through small salt horses, and the salt is handled in the same manner.

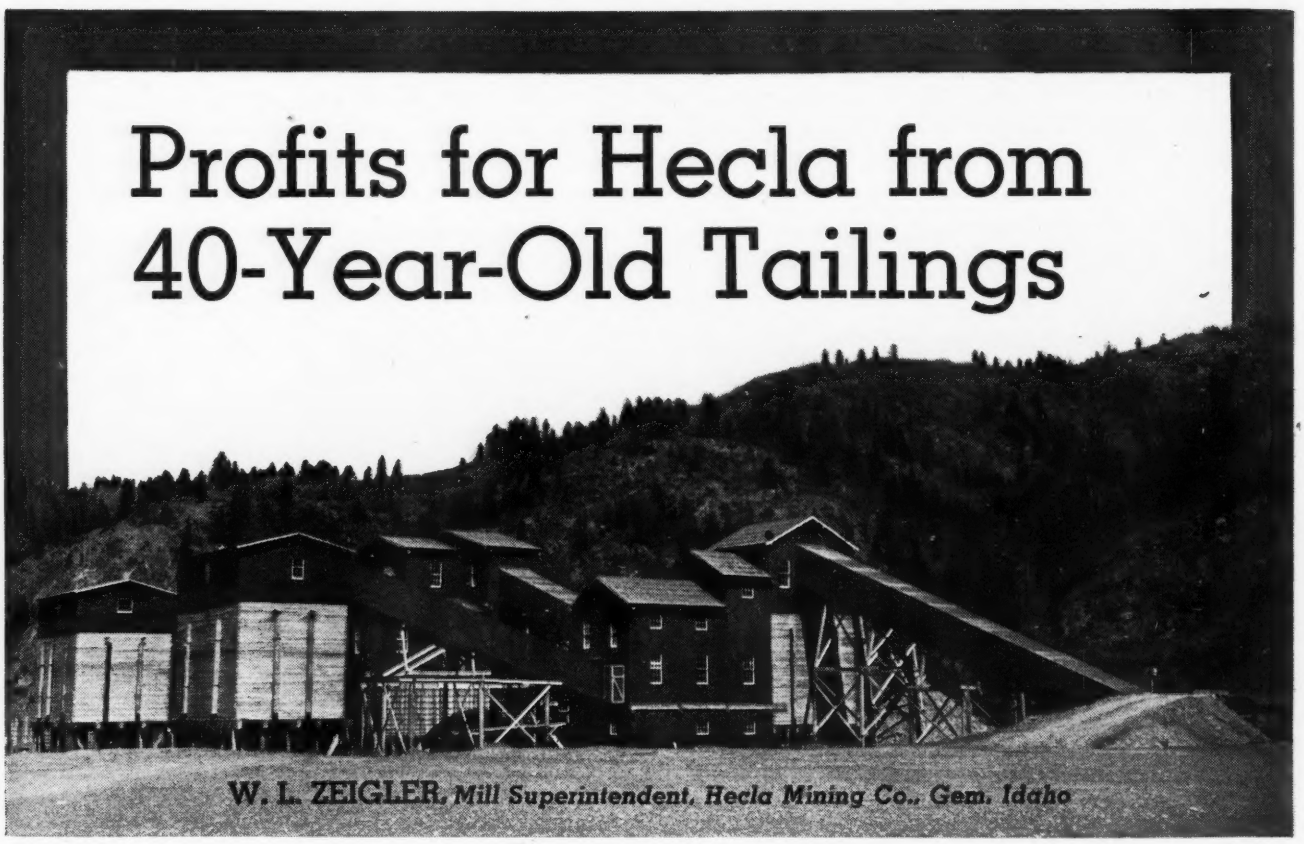
The advantages of the caterpillar-mounted loader over the track-mounted machine under prevailing conditions are: first, ease of gobbing salt in old rooms; second, higher loading capacity due to the shorter switching interval at loader; third, reduction of amount of brushing required to extract thinner beds; fourth, reduction of amount of track laid.

Track-mounted loading machines are more readily moved to widely separated faces and are preferred for development entries.

Production record of the shuttle-car units as used has been variable and no outstanding record has been made. Average production per unit is now approximately 600 tons per shift. Record production for one shift, using two shuttle cars, was slightly over 1,000 tons.

G. F. Coope is president of Potash Company of America and R. M. Magraw general manager.

Profits for Hecla from 40-Year-Old Tailings



W. L. ZEIGLER, *Mill Superintendent, Hecla Mining Co., Gem, Idaho*

SINK-FLOAT AND FLOTATION are combined in this Hecla Mining Co. tailings re-treatment plant at Osburn, Iddho, in a venture made feasible only by application of modern materials-handling methods

DEVELOPMENT of differential density processes has made it possible for the Hecla Mining Co., at Osburn, Idaho, to recover lead and zinc from about 2,000,000 tons of jig tailings laid down in the bed of the South Fork of the Coeur d'Alene River about 40 years ago, and heretofore regarded as impossible to treat profitably because of their low metal content.

Using a modified version of the H. & H. Sink-Float process in operation at the Bunker Hill plant in Kellogg, the Hecla mill treats about 2,900 tons of the tailings daily and produces lead and zinc concentrates for smelting and a feed of commercial grade for the company's flotation mills. The methods employed include screening, sink-float separation, and lead and zinc differential flotation.

The existence of the tailing pile now being mined is due to a piling-and-plank dam erected in 1904 across the South Fork at Osburn to impound the tailings of the jig mills treating ores from the Gold Hunter, Morning, Snowstorm, National, Hercules, Frisco, Hecla, Standard, Mammoth, and Tiger mines. Although this dam washed out in the flood of 1907 and has not been replaced, there accumulated an estimated 2,000,000 tons of tailings assaying about 2 percent lead and 2 percent zinc, and it is this deposit, unchanged since 1907, that is now being mined by Hecla under lease agreements with the various companies which own the land.

The area containing the tailings is more than a mile long and reaches a width of nearly half a mile in wider parts of the river valley. The material to be treated ranges in size from 6-in. river gravel down to fine sand. Slime is present only in a few low spots in the flat, and these areas will be mined and treated separately. In general, the material in the range, 6-in. to 30-mm., is river gravel, and the finer material consists of bull jig tailings and fine jig middlings and tailings.

Reclaiming With Scrapers

The tailings are reclaimed by a 12-yd. LeTourneau Carryall drawn by a Caterpillar tractor. This equipment will be used until a haulage distance of 2,000 ft. has been reached, after which a 1-yd. power shovel and trucks will be used. Each Carryall load weighs about 18 tons and a trip is made every 10 min. on the average. Tree stumps, float timber, and gravel bars constitute the only obstacles in the mining operation, except during freezing weather, when the frozen top crust on the sands must be pushed aside to await warmer weather treatment.

In planning this project, factors such as the limited life of the operation, the scarcity of building materials, and the lack of both skilled and unskilled labor had to be considered. Steel for constructing plant buildings was unobtainable, and the freezing order for cement and sawed lumber made it necessary to use a wood pile foundation for all construction work. Ordinary round mine stulls were used, and 347 such piles were driven 6 to 8 ft. into the river gravel to provide foundations for the loading and storage bins, the thickeners, and the various buildings. Buildings and bins are made of wood; wall and roof exteriors are covered with asphalt composition roofing and felt paper. The main plant units are the screening plant, the sink-float plant, and the flotation plant.

The treatment plant, including the three units already mentioned, is located in the approximate center of the deposit. Two earth ramps provide access to the 30-ton steel-lined loading bin, into which the reclaimed

tailings are dumped. A steel grizzly covers the top of the bin in order to screen out coarse gravel and driftwood. Flow through the plant thereafter is indicated in the accompanying flowsheet.

Reclaimed water is added to the boot of the elevator handling the minus-1¼-in. sand from the main storage bin, to provide a preliminary scrubbing in preparation for the following screening and washing steps. The elevated sands pass over two vibrating screens with 4-mm. openings that are unusual in being divided into five sections, each separated from the next by a step that forms a deep washing pocket for the ore. Reclaimed water is used on the first two sections, fresh water on the next two, and the last serves as a draining section. Screen oversize constitutes the feed to the sink-float plant.

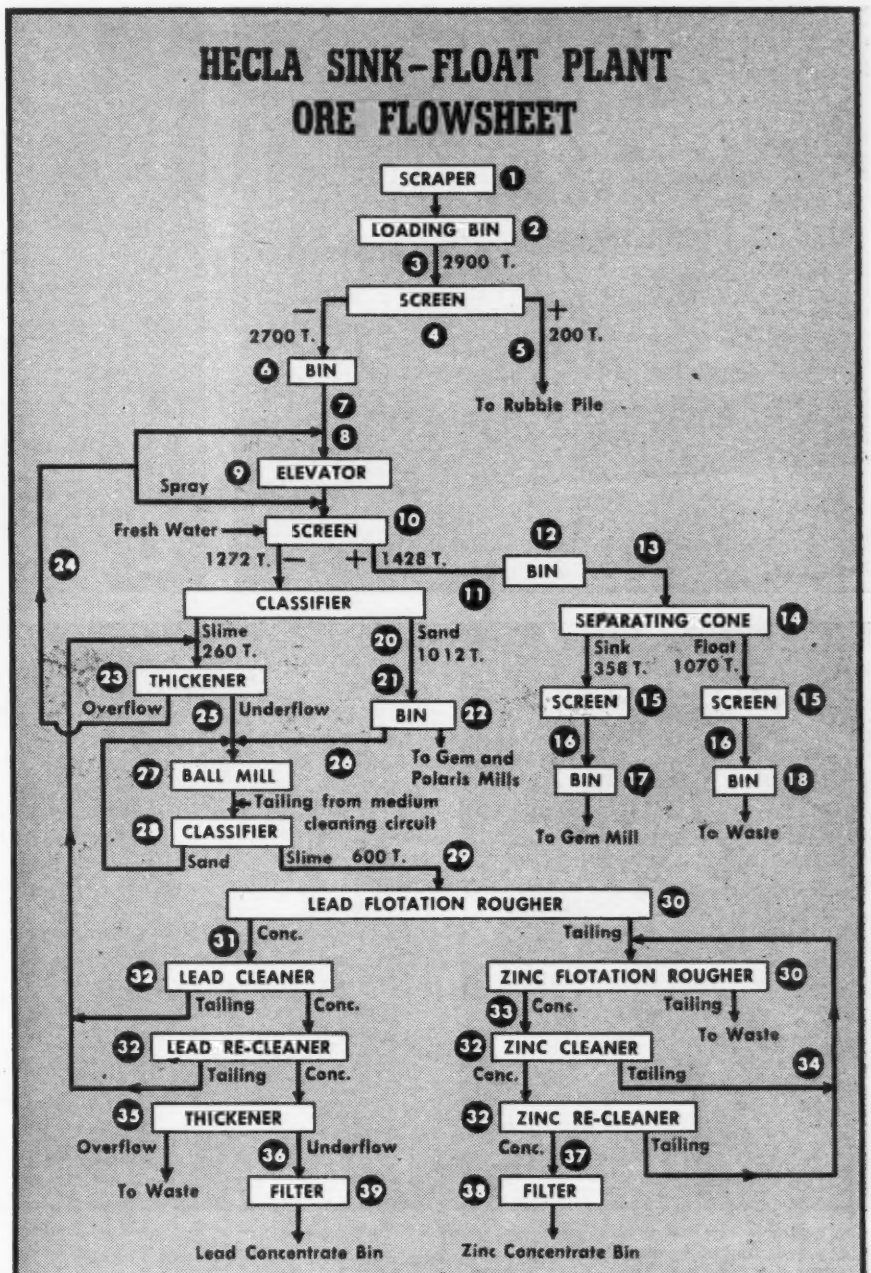
Fines Removed

The reason for providing these washing pockets is that it is of the utmost importance to remove completely all the fine material and the excess water from the screen oversize. If this is not done, the sink-float medium (galena) will become contaminated eventually and trouble will result. The washing pockets have been successful, both in preventing contamination of the medium and in cutting down the water requirement necessary for complete removal of the minus-4-mesh material.

The sink-float section makes use of the H. & H. process, and follows closely the design of the Bunker Hill sink-float plant, although certain improvements in plant layout and control have been made as they were indicated by experience at the Kellogg plant. The heart of the Hecla plant, the separating cone, is a duplicate in size (8x9 ft.) of the Bunker Hill cone. Fine galena suspended in water to give a medium density of 2.9 fills the cone, and the minus 1¼-in. plus 4mm. material from the screening plant is fed onto a submerging paddle at the top of the cone, which insures complete wetting of the ore by the medium.

The float product is moved across the surface of the medium by a series of synchronized paddles, and is discharged, along with a controlled amount of medium, onto the deck of a vibrating screen. Here again it was found necessary to use a five-section stepped screen with the washing pockets to insure complete removal and recovery of adhering medium. The washed float product goes to the waste dump.

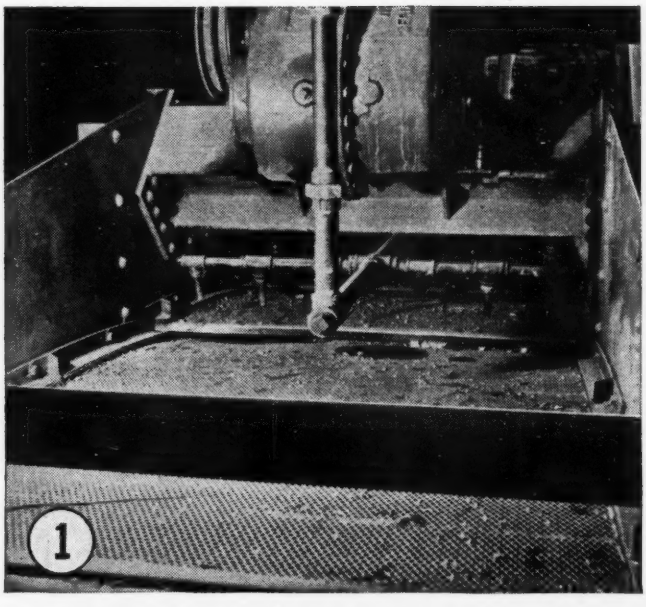
The sink product (plus 2.9 in dens-

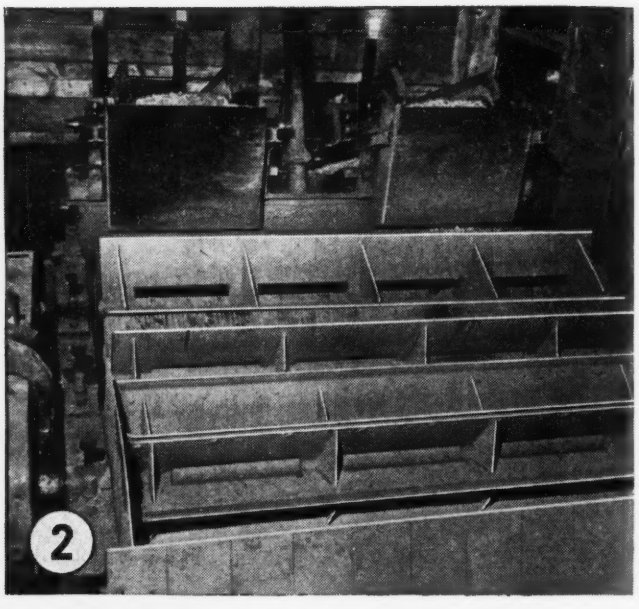


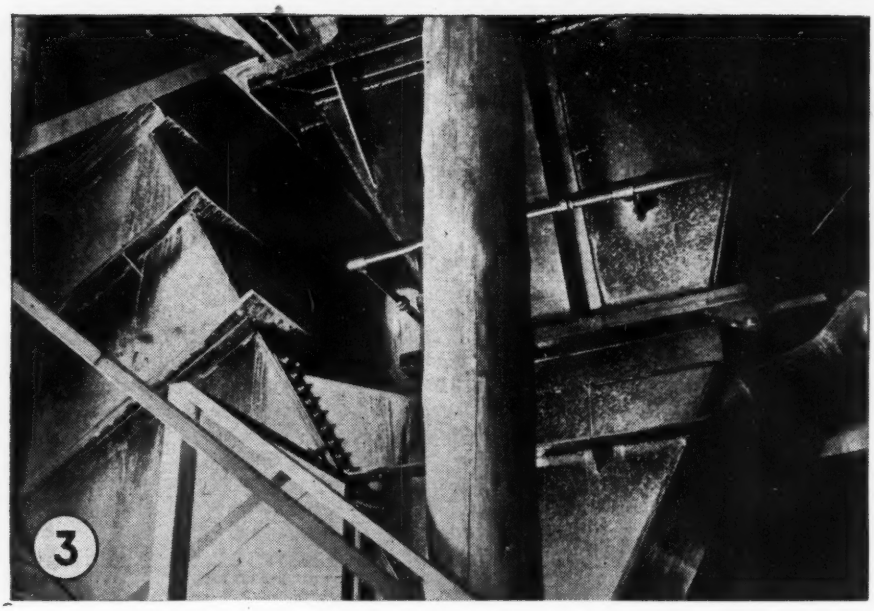
LEGEND

Daily tonnage of ore is shown wherever possible

1. LeTourneau Carryall, 12-yd., and Caterpillar 80 tractor.
2. Steel-lined bin, 30-ton.
3. Belt conveyor, 30-in.
4. Allis-Chalmers Ripl-flo screen 10 x 4-ft., 1¼-in. openings.
5. Belt conveyor, 22-in.
6. Bin, 500-ton.
7. Four 18-in. belt feeders.
8. Feed conveyor, 18-in.
9. Bucket elevator, 24-in.
10. Two Allis-Chalmers low-head vibrating screens, 4 x 14-ft., 4-mm. openings.
11. Belt conveyor, 18-in.
12. Draining bin, 100-ton.
13. Two belt feed conveyors, 30-in.
14. Sink-Float separating cone, 8 x 9-ft., density, 2.9.
15. Two Allis-Chalmers low-head vibrating screens, 4 x 14-ft., 3-mm. openings.
16. Two belt conveyors, 18-in.
17. Sink bin, 400-ton.
18. Float bin, 300-ton.
19. Drag classifier, 4 x 25-ft., 65-mesh separation.
20. Belt conveyor, 18-in.
21. Shuttle conveyor.
22. Bin, 600-ton, for minus 4-mm., plus 65-mesh sand.
23. Thickener, 30 x 8-ft.
24. Bingham pump, 2-in.
25. Frame "A" Hydroseal pump.
26. Belt feeder, 14-in.
27. Hardinge ball mill, 10 ft. x 48 in.
28. Wemco, 50-in., spiral classifier.
29. Frame "B" Hydroseal pump; pulp, 30 percent solids, 80 percent minus 200 mesh.
30. Fagergren, 4-cell, 56-in.
31. Sand pump, 2-in.
32. Denver, 2-cell, 18-in.
33. Sand pump, 2-in.
34. Sand pump, 2-in.
35. Thickener, 18 x 8-ft.
36. Bucket elevator, 6-in.
37. Bucket elevator, 8-in.
38. American leaf filter, 4-ft., three-disc.
39. Oliver filter, 3 x 4-ft.







1. STEP CONSTRUCTION forms five washing pools on vibrating screens like this one, and results in effective removal of fines

2. SKIMMING PADDLES on top of separating cone remove float

3. SEPARATING CONE in center, sink elevator at left. Note mine stull substituting for steel in building construction

Table I. Metallurgical Data, Hecla Sink-Float Plant

	Weight, Percent	Silver, Oz.	Lead, Percent	Zinc, Percent
Washing-plant feed	100.0	1.60	2.00	2.00
Float product	36.0	0.15	0.30	0.20
Sink product	16.0	2.70	4.00	2.60
Classifier sands (−4mm.+65 mesh)	38.4	1.89	2.18	2.64
Slimes, −65 mesh	9.6	4.02	4.30	5.20
Separating cone feed	100.0	0.94	1.44	0.94
Float product	69.2	0.15	0.30	0.20
Sink product	30.8	2.70	4.00	2.60

Table II. Flotation Concentrates, Typical Assays

	Silver Oz.	Lead, Percent	Zinc, Percent
Lead concentrate	61.0	68.0	4.0
Zinc concentrate	8.5	4.1	52.5

ity) is removed from the bottom of the cone by a 24-in. inclined bucket elevator and discharged onto a second vibrating screen, where it receives the same treatment as the float product. The washed sink product is shipped by truck and rail to the Gem mill. Metallurgical data regarding the sink-float plant are given in Table I.

It will be noted that the finer sizes of the plant feed are higher in zinc and lead than the coarse. This is due to the prevailing practice in the mills that produced the tailings of crushing jig middlings and returning them to the circuit. The finer sizes are therefore higher grade, and the sink-float separation is thereby rendered more effective on the coarse portion of the feed in rejecting clean waste. Table I shows typical results, although some variation in screen analysis and metal content is encountered as different strata of the deposit are mined.

Though the medium circuit is shown in the accompanying flowsheet, a few remarks concerning it may be helpful. The ore fed to the cone brings some water with it and thus dilutes the medium, a tendency that is counteracted by adding continuously a quantity of extra-heavy medium from the underflow of the

medium surge tank (marked "6" in the flowsheet). A portion of the medium drained from the first sections of the float screen is returned to the lower part of the separating cone to aid in maintaining uniform density.

The plus-40-mesh material from the screen onto which the main medium elevator discharges goes to a drag classifier, then on to a screen. This material is small in amount and consists of sand with adhering particles of galena. A final washing on the screen sends the galena to the medium cleaning circuit and the sand to join the sink product.

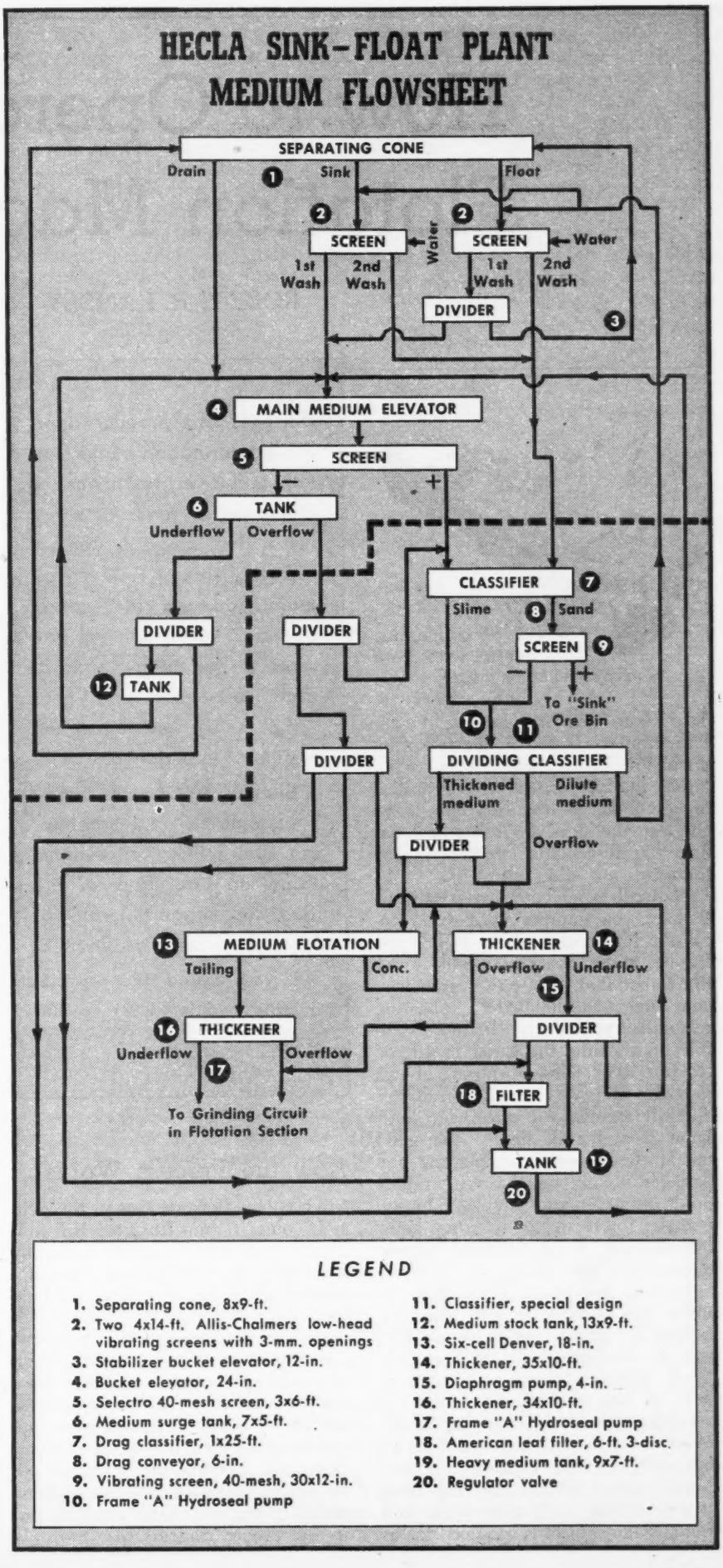
Extremely fine foreign material, picked up in the medium during the washing process, is removed in the six-cell flotation machine, though the feed to flotation can be diverted to the medium thickener directly if cleaning seems unnecessary. The flotation tailing goes to the grinding plant.

Two Medium Circuits

In the medium flowsheet, the broken line divides the area roughly into the operating medium circuit (upper) and the medium cleaning circuit (lower). As will be seen, operation in both is extremely flexible, and close control can be maintained. Cleaned, thickened medium is returned to the operating circuit through the regulator valve (20) on the heavy medium tank. Rate of flow through this valve is adjusted to compensate for the dilution of the operating medium by primary wash water brought into the cone on the ore.

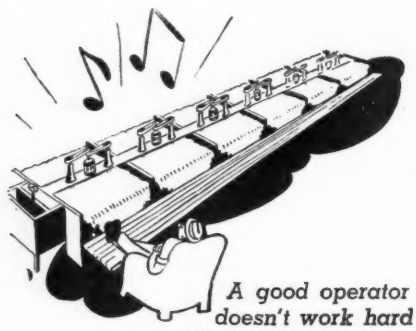
Feed to the main flotation section of the plant is made up of minus-65-mesh material classified out of the minus-4-mm. fraction of the original plant feed. Enough of the minus-4-mm. plus-65-mesh sands is added to bring the total flotation plant feed to about 600 tons daily. The grinding and flotation practice used here is similar to that used throughout the district, and details are shown in the accompanying flowsheet. Typical assays of the lead and zinc concentrates obtained are shown in Table II.

Five men are required on each shift for plant operation, including the man required to clean the grizzly on which the Carryall, or the trucks, dump the tailings. Several maintenance men, including the foreman, work on day shift in addition to the five operating men. The quantity of zinc produced per man-shift in this plant is very high in contrast to that produced from underground operations in the district, a circumstance that is due to the fact that the material is excavated and handled largely by mechanical equipment.



How to Operate a Flotation Machine

ROBERT H. RAMSEY
Associate Editor



A good operator doesn't work hard except with his head . . .

Here is some practical operating information of the sort not found in textbooks or the average manufacturer's instruction manual. Merely reading this article won't make you a good flotation operator, but it will tell you some of the things to do in order to become one. There is no theory here — just the results of experience.

Similar articles are being contemplated on other mining and milling operations. What do you think of the idea? Your suggestions on topics and methods are invited.

If you would like reprints of this article write to the Editor.

THE MAIN IDEA in collecting the information you'll find in the following discussion was to help you, as a flotation machine operator. Regardless of how much or how little you know about it, the ideas you'll find here can help you do a better job, if you want them to.

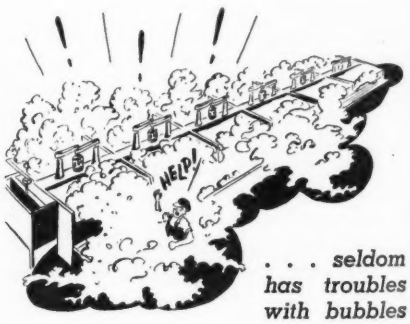
Naturally your company is anxious to have you improve your work, because a lot depends on how well you handle those machines; but don't think that that's the only reason why you ought to do better. The big reason, for you, is that the more skillful you become, the easier it will be for you. The fellows who are always in a jam and working their heads off all shift are also the ones who don't know what it's all about. The good operators see trouble coming and prepare for it, and for that reason they don't often get into trouble. The job is easier for them because they know how to do it. We want to try to make it easier for you, too.

Because we don't know how familiar you already are with the flotation process, we'll have to assume that you are starting about from scratch. Well, the first thing you ought to learn is how the process works and what it is that you are trying to do. We'll leave the chemistry of flotation out of it, though, because it doesn't much matter to you why the thing works so long as it does work, and, frankly, the subject is too deep for us.

How the Process Works

The plain facts are that in the pulp as it comes to you from the ball mill circuit is a small quantity, generally a few percent, of a mineral your company expects you to get out. To do this, you will add to the pulp one or more chemical reagents that have the property of combining with the valuable mineral in such a way that these particles of ore can no longer be wetted by water. These reagents do not combine with the waste rock particles, and therefore the latter can still be wetted. Suppose you are working with a galena ore. After you have put in the proper reagents, if you could take a piece of galena out of the pulp and magnify it, you would see that water rolls off the galena as it would off a duck.

Then when the pulp goes to the flotation machines, you add another reagent that creates a froth in the pulp. That is, the reagent helps form millions of air bubbles that are circulated all through the pulp by the action of the machine. Whenever one of these bubbles hits an ore particle that is not wetted by water it sticks to that particle, and before long there



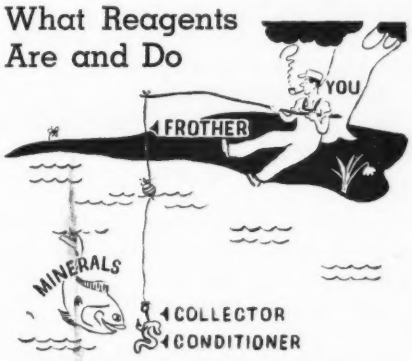
. . . seldom has troubles with bubbles

are many such mineral particles sticking to each bubble. None of the bubbles will stick to the waste material. The result is that these air bubbles collect on the surface of the pulp in the machine to form a froth, and all you have to do is see that this froth spills over the side into the proper launder. The valuable mineral is now in the launder, and the waste rock is going down the tailing flume—you hope.

All you have to do is to see to it that enough of these reagents is added, but not too much, and that the machines are working properly. That doesn't sound like much of a job, but, believe us, it's an art. The thing for you to do if you want to be really good at it, is to ask a lot of questions of people you can count on as know-

ing the answers. Don't be afraid of asking "fool" questions. The mill superintendent and the metallurgist and the shift boss would a lot rather have you ask questions of them and find out how to do the job right, than to have you keep still and do the job wrong.

What Reagents Are and Do



How the reagents work

Let's have a word or two about those reagents. There are three classes of flotation reagents in general: conditioners, collectors, and frothers. Conditioners are those reagents that are added to the pulp to help the other reagents do a better job. That definition covers a multitude of sins, and we haven't space to take up all of them. To list a few conditioners, there are: lime, copper sulphate, soda ash, sodium silicate, Aerosol, and several more. Each of them has a specific job, and it is up to you to learn what it is for the one you are using.

Take lime, for example, which is generally used in flotation to keep pyrite from floating and to adjust the pH of the circuit. What's pH? Just a flashy term for a convenient way of telling how much acid or alkali there is in the flotation pulp. A pH of 7 means that the pulp is neither acid nor alkaline; above 7, the pulp is alkaline, below 7, it is acid. Lime makes the pulp more alkaline, resulting in a pH of 8, 9, 10, or so, depending on how much you add. In some mills, this matter of pH is tremendously important, and it will pay you big dividends in easy operation if you pay attention and keep the pH where it belongs.

Collectors are the reagents that catch hold of the mineral you're after. The xanthates, thiocarbanilid, several of the Aerofloat reagents, T-T mixture, Minerec—all are collectors. If you don't add enough of whichever one of these you're using, the company loses money fast, and you'll have words with the shifter tomorrow when the assay sheet comes around. Of course, if you are working in a mill where the metallurgist sets the reagent feed rates, the buck is automatically passed.

Frothers are the reagents that make the bubbles that lift the mineral out of the pulp. Pine oil, cresylic acid, B-48 and several other numbered reagents are the most commonly used frothers. Their action is simple. More frother, more bubbles. Less frother, fewer bubbles. Don't ever drop a bucketful of pine oil into the flotation machine feed box unless you're tired of working there.

Only three or four of these reagents are being used in your plant. Your job is to find out for sure exactly what each of them is for in your operation. Don't go by what somebody said he heard somebody say the fellow that grinds samples in the assay office said. Buttonhole the metallurgist, if he hasn't already told you, and make him tell you what the reagents are supposed to do. Better still, ask him to put it in writing, or you write it down as he tells you. We know from experience that some flotation operators have ideas about the reagents they are using that would give the mill superintendent the shock of his life if he knew about it. That isn't the operators' fault. Nobody had ever told them the facts of life. Don't you be like that.

Know Your Machine

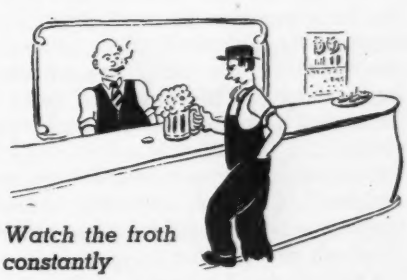
Now, to get right down to the actual operation, what are the elements with which you have to work? First, of course, are the reagents we mentioned before, and with regard to them we can only repeat our advice to find out as much as you can about how they work. Also, if you are permitted to adjust the reagent feeders yourself, go easy with them. Don't be rushing up every ten minutes to add more xanthate or cut down the pine oil a drop or two. By the time you have made some such small change, the pulp conditions may have changed a little, and you'll simply wear yourself out trying to catch up with conditions that stay one jump ahead of you. Don't over-control.

Aside from the reagents, you have the machine controls to work with. These are different with different makes of machine, but, in general, they are: the tail gate at the end of each bank of cells; weirs placed in some makes between each cell; weir bars placed along the lip in each cell over which the froth flows; other types of adjustable partitions between cells; and, in some makes, a valve that controls the air admitted to each cell.

In general, you will make up your mind about how to control the machine and the reagents by the appearance of the froth coming out of the machine. We could go on here for several pages describing what a flotation froth ought to look like for all the different kinds of minerals that are now being floated, but you'd be interested in only a small part of all that. Here, again, the best thing you can do is get somebody who knows to tell you when the froth in the rougher cells and the cleaner cells looks the way it ought to look. Then you take a good long look at it and try to keep it that way when you're running the machines.

There are, however, certain characteristics that apply to most flotation froths. The bubbles in the froth from a cleaner cell, or from the first couple of cells in a rougher section, should be fairly large, say an inch or so across, and they should be well loaded with mineral and should break down easily when they drop into the launder. If you look at them closely, you will see in the center of each bubble a thin spot that is almost clear, like a little window, and the surface of the bubble will have a slightly watery shine on it, as though it were actually wet. These "windows" and this watery look are, in most cases, a good sign. They mean that the bubble is neither too tough nor too brittle, and that there is a draining action going on along the surface of the bubble that allows waste mineral, shoved up accidentally by the bubble, to drain back into the pulp, where it belongs.

The froth in the rest of the rougher cells should, in most cases, look quite different. The bubbles are smaller, more like the head on a stein of beer, and they don't carry as much mineral. Also, the froth in the roughers spills over faster; in fact, the rougher cells are spoken of as "running faster." Here you don't have to worry about waste draining back into the pulp; the main idea is to get the ore mineral out fast.

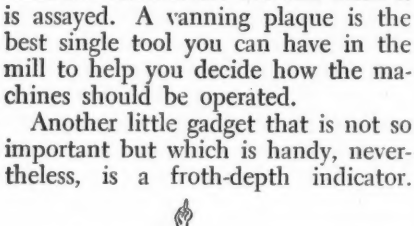


Watch the froth constantly

Watch the froth constantly, then, and learn from it, but don't stop with just watching it. You can't be sure of what that froth is carrying unless you really break it down and see. Millmen who sweep their hands across the froth in a cell and then tell you ex-

actly what's in it may be kidding themselves and you, too. There ought to be a white-enameled vanning plaque kept down in the mill at all times, and you ought to learn to use it properly. We can't describe in words how to handle a vanning plaque, because its use requires a peculiar combination of motions that defies description, but with a little practice and advice from someone who knows, you'll get it all right. Then when you take a little froth on the vanning plaque, and break it down, and spread it out, you'll see exactly what minerals are being carried by the froth, and, more important, how much of each mineral. If you do that long enough, you'll be able eventually to forecast pretty accurately about what the concentrate will run when it is assayed. A vanning plaque is the best single tool you can have in the mill to help you decide how the machines should be operated.

Another little gadget that is not so important but which is handy, nevertheless, is a froth-depth indicator.



Check the froth depth regularly

This is simply a wood slab about a foot square and 2-in. thick, in the center of one side of which is fixed a 1x1-in. stick about 18 in. long. The stick must be set perpendicularly to the slab. Set the slab in the classifier or the feed box or some place where the pulp is the same density that it is in the machine, and let it float for a moment. Then measure up from the watermark and mark the stick off in inches and halves. Then to measure the froth depth in the cell, drop the slab into the cell, let it float, and read the depth at the mark nearest the froth surface. This comes in handy because it is sometimes necessary to control the froth depth pretty closely (deeper on cleaners, thinner froth on roughers), and this indicator is the simplest way we can think of to measure froth depth accurately.

One of the best ways of keeping track of what's going on in the machine is to keep a little log of the things you observe and to note down in it the assays of the samples that were taken during that time. Did the froth look dry and tough during most of the last shift? Note it in your book, then see how the assays compare with those corresponding to other froth conditions. You can learn best by experience, and a written record of that experience is a far more reliable guide than your memory, however good your memory may be.

How to Be a Good Operator

Try to keep ahead of troubles

The thing that makes a man a really good flotation operator is his ability to see trouble coming and to avoid it. A good man watches what's going on and runs the machines instead of letting them run him. For example, by noticing little changes in the froth conditions or the pH of the pulp a man can sometimes get a warning of an approaching change in the kind of ore coming into the mill. To treat this different type of ore, he may have to use more lime or more frother or he may have to change the adjustment of the machines. Whatever he has to do, the main point is that by the time the change in ore actually arrives, he is ready for it.

A poor operator, on the other hand, usually gets caught flat-footed by such changes. He catches on only when the froth drops altogether, or begins pouring over, as the case may be, and he has to spend the next hour or so in a sweat trying to straighten things out. Then just about the time he's off rolling a cigarette and telling the shifter, "Well, I got that licked," the ore changes again, the froth goes haywire, and our friend is right back in the deep hot grease. By the end of the shift, he's usually run ragged, and the tailing assay for his shift is higher than a kite. He just works too hard.

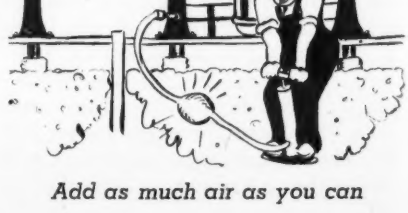
As we have already noted, the kind of froth you get and the amount of mineral it carries depend pretty much on the reagents you add. The machine controls, however, determine the rate at which the froth comes off the cells. To run a machine "faster"—that is, to make more froth spill over—you raise the pulp level, lower the froth lips, or let in more air. To run the machines "slower"—that is, to cut back on the amount of froth—you simply reverse these things.

You can also speed up or slow down the amount of froth coming off by changing the amount of frother added, but remember, *it is better not to*. In general, you should add only just enough frother to get the sort of bubble you want. Therefore, if the machine isn't frothing to suit you, try to make it right with the machine controls first (the weir bars, the pulp level, the air controls). Only when you can't get the right conditions with the machine controls should you begin changing reagents.

One exception to this is a condition when you see quite plainly that you have altogether too much reagent. If the froth is boiling over, for example, and it has an oily look and consists of extremely tiny, uniform bubbles, go look at the frother feeder. You are probably using too much. In other words' don't hesitate to cut down on reagents if conditions seem to warrant it; but think twice, or three times, before you add more of anything.

There is also an order of preference, you might say, for the machine controls. In general the pulp level in a roughing machine should be carried as high as you can get it and still leave about 2½ to 3 in. of froth above it. (There's where your froth-depth indicator comes in handy.) This is done to help recover more of the mineral you want. The high pulp level holds the mineral in the machine longer, and gives the air bubbles more chances at it. The thin froth, overflowing rapidly, snaps the weakest-floating mineral over into the concentrate launder before it can drain back.

Because this high pulp level in a rougher machine is harder to regulate than the froth depth, it is better to work with the weir bars along the froth lips instead of with the tail gate, or the weirs between cells, if your machine has them. Also, if your machine has an air control (like the Agitair, the Weinig, or the Pan-American) it it better to keep the valve as wide open on the roughers as you can. This is because the more air you add, up to a certain point, the more mineral you're likely to pick up. In addition, the more air added to mechanical machines, the less power they draw and the less wear there is on the impeller. In short, don't cut the air unless you have to, and then do it for as short a time as possible.



Add as much air as you can

In contrast to a rougher, a cleaner machine needs a deeper froth in order to allow time for unwanted mineral to drain from the froth bubbles back into the pulp. Also, a high pulp level isn't so important in a cleaner cell, because recovery isn't what you're after so much as grade of concentrate. Therefore, in a cleaner cell, a froth depth of at least 8 in. is required in most cases, and you have more leeway in adjusting the pulp level. That is why, in operating a cleaner, you can use the tail gate (or the cell weirs) more than on a rougher.

In cleaning, the rate at which the froth comes over is extremely important, and both the air control and tailing weirs should be used to get the fine adjustment that will give you the best results. Froth scraper adjustment and weir bars, if there are any, may help, but to a lesser extent. Here is where your vanning plaque comes in handy. To run a cleaner properly, you must know what is in the cleaner froth, and the only way you can really find that out is by spreading some of that froth out, not on the palm of your hand, but on a vanning plaque.

All this, remember, is a general statement applied to all operations. In your own mill there may be good reasons why you have to run the machines differently. In that case, find out what pulp level and what froth depth your metallurgist thinks are right, and then keep them that way. But the order of preference still holds, no matter what. On the roughers: weir bars first, then air, then tail gate (or cell weirs), then reagents. On the cleaners: air first, then tail gate (or cell weirs), then weir bars, then reagents. If none of these things works, see if you can't get a job down in the mine.

Types of Machine

Pneumatic. Nearly everything we have said up to here applies to both air and to mechanical machines. By "air" machines, we mean those like the Miami, Forrester, Southwestern, Macintosh, and others. There isn't much to add that applies only to these machines. In fact, in most cases, air machines are rather easier to control than mechanical machines, though the possible adjustment isn't so fine, for example on cleaning operations.

Hog Troughs. This term rather loosely describes mechanical machines built on the lines of a long trough in which the impellers are set at regular intervals. There are no pipes or weirs between cells. The type is represented by the Agitair, the "Level-Type" Fagergren, and the Pan-American.

With these machines, as with air machines, the one tail gate controls the pulp level throughout each group of cells. If you want to vary the pulp level between cells somewhere up the line, the only way is to widen or narrow the opening in the partitions between impellers. There is very seldom any real need for this adjustment, and it is better not to try it.

Having the pulp level in the whole machine controllable by the one tail gate may tempt you to whirl the gate up or down every time an adjustment is indicated. Don't do it. Pick a level for the roughers that is about right (good and high, remember), and leave it there. If you have to change the gate, return to the original setting as soon as you can. You can spot this by counting the number of threads exposed above the handwheel when the gate is where you think it ought to be. This gives you the exact location of the gate and saves measuring each time.

Poke a stick into the tail box once in a while to see that it isn't sanding up. If the tail box does get partly sanded up, the pulp level will run higher than you want it and may overflow the machine. Remedy this by opening the sand bleeder gate a little, but don't open it farther than necessary. Make all the tailing come out over the tail gate if you can.

Unit Cell Construction. This type of cell is represented by the Denver, the Weinig, and the older model Fagergren machines. We mentioned "weirs between cells" a lot in our discussion. This is where they are used.

The peculiar virtue of a weir to control the pulp level in each cell is that it permits you to get an extremely nice adjustment of the rate of froth overflow down the length of the machine. One cell fast, the next slow, the next fast, and so on, if you happen to want it that way. This is an extreme example, of course, but it shows what could be done. The practical effect of this flexibility is that you can get an extremely high-grade concentrate with these cells if you handle them right.

But by the same token, these individual cell weirs can get you into an awful lot of trouble if you don't handle them right. Here again, we say, don't over-control, and do try to anticipate trouble. If you do get caught, however, and you find the froth has dropped in all the cells, or that the machines are wildly overflowing, start with the tail-end weir, adjust it properly, and so work back up the line of cells to the head end. But take our word for it, it is better not to find the cells in that condition.

When Trouble Comes

You will of course get into trouble now and again. Pipes will plug up, froth will spill out over the floor, belts will break, bearings get hot, launders leak. We just haven't space to list here all the things that could happen to you and suggest remedies for them. Besides, we don't know all the things that could happen to you. The important thing, anyway, is to keep your head, figure out the cause of whatever went wrong, and then think up a way to correct it.

One jam an operator always seems to get into sooner or later, however, is this matter of oil or grease in the pulp. A case is on record where a man cleaned the black grease from under the big gear on a ball mill and tossed the goo into the flotation feed launder to get rid of it. The result was a cross between a bubble bath and the Johnstown flood. Oil and grease are frothers, too, but don't use them as such. If, somehow, oil does get into the circuit and the froth comes pouring out on the floor, all you can do is flush things out as quick as you can, tell the shift boss some miner must have dumped his oil bottle into the muck, and pray he'll believe you.

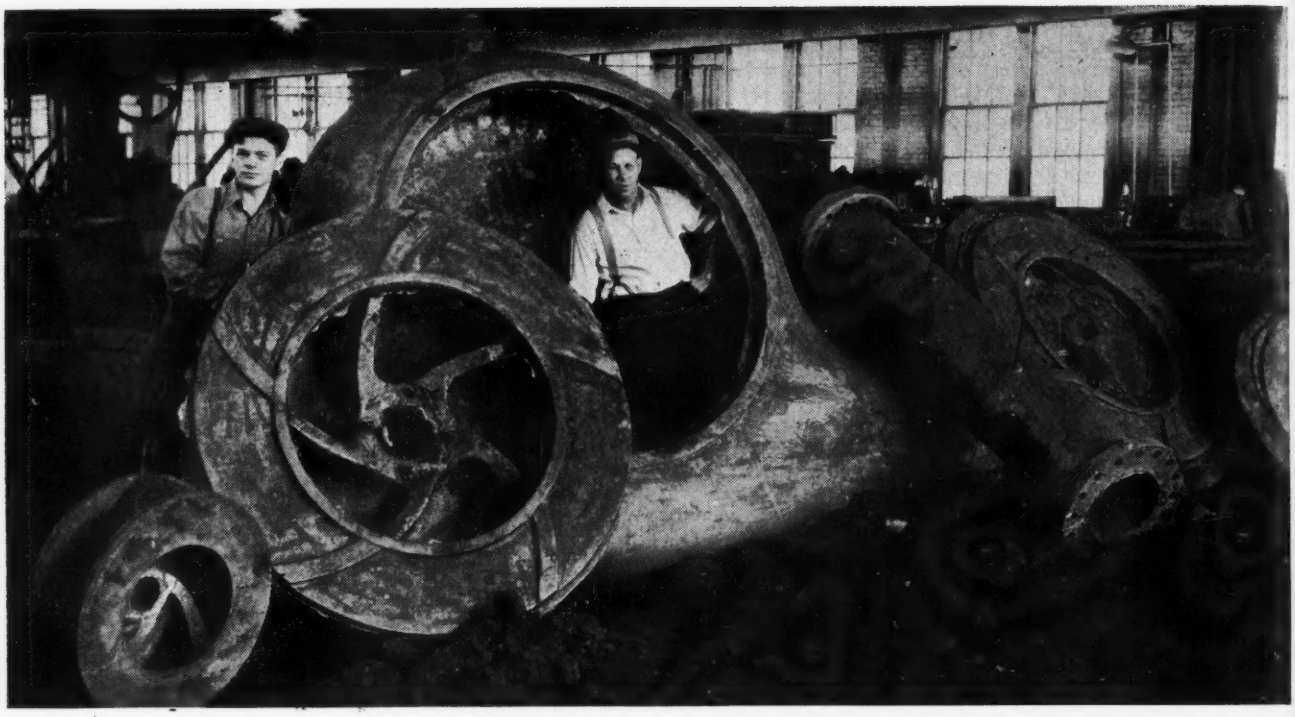
What It Adds Up To

Don't over-control

This whole discussion could be summed up pretty well in the following suggestions: (1) Ask a lot of questions and find out, from people who know, exactly what it is you are trying to do. (2) You control the machines, don't let them control you. (3) Don't over-control. (4) Think about your job and try always to learn more about it. Things like the use of vanning plaques and the proper handling of weirs and air valves are mechanical details that can be learned by practicing with them. The desire to do a better job is the important thing. Once you have that, the rest will be easy.

* * *

Grateful acknowledgment is made of the helpful suggestions of Arthur J. Yahn, mill superintendent of Shenandoah-Dives Mining Co., Silverton, Colo., and of Walter E. Duncan, metallurgist for Mahoning Mining Co., Rosiclare, Ill.



DREDGE-PUMP CASINGS AND IMPELLERS in the rough, in C. & H.'s shops. Made of nickel-chromium white iron, the parts include a 20-in. liner and a 55-in. impeller for 10-in. to 20-in. pumps

Wear-Resistant Castings Cut Maintenance Cost

ROBERT McINTOSH, *Mechanical Superintendent, Calumet & Hecla Cons. Copper Co., Calumet, Mich.*

TO INCREASE THE ABRASION RESISTANCE and the resultant life of parts of equipment that are subject to wear, Calumet & Hecla Consolidated Copper Co., in the Michigan Copper Country, has successfully employed nickel-chromium white iron extensively in castings. The range of the analysis of the material used is within that established for Ni-Hard. The following composition limits have been found best for obtaining a material of optimum wear-resistance for the applications made:

Total carbon, percent	3.40 to 3.75
Silicon, percent	0.35 to 0.50
Manganese, percent	0.40 to 0.70
Nickel, percent	4.50 to 5.00
Chromium, percent	1.50 to 1.75

These applications, the scope of which includes the company's mining, milling and smelting operations, include:

1. Dredge-pump shell liners, impellers, pipe and flanged elbows.
2. Stamp shoes, mortar dies and mortar liners.
3. Ball-mill liners.
4. Grinding balls.
5. Scoop feeders.
6. Akins spiral classifier shoes.
7. Flotation impellers, pans, and hoods.
8. Pulleys for Clark copper-casting wheels.
9. Welding rod for hard-surfacing worn-down equipment.

In the four-year period 1939 to 1942 the quantity of such castings produced by Calumet & Hecla has approximated 3,500,000 lb.

Some of the applications listed are discussed in detail as follows:

Two dredges, equipped with 20-in. suction pipes 140 ft. long and 20-in. sand pumps, are used for pumping the company's own tailing sands from Torch Lake to the reclamation plants at Lake Linden and Tamarack. Although the life of wearing parts in these pumps varies widely with operating conditions and the soundness of the castings, the averages of the data recorded over a period of years provide a favorable comparison between the ordinary white-iron parts used previous to 1939 and those of Ni-Hard used since then. For the 20-in. pump parts the record shows a life of 3,500 hours for shell liners made of nickel-chromium white iron, compared with 700 hours for liners of ordinary white iron, a ratio of 5 to 1. Life of the impellers made from the two respective materials was 1,850 hours and 500 hours, a ratio of 3.7 to 1 in favor of the nickel-chromium iron.

These ratios are fairly typical of results obtained with all our sand pumps ranging in size from 20-in. down to 6-in., and the tendency is toward further improvement in the later records of the nickel-chromium iron parts.

LIFE OF PUMP PARTS subject to abrasion on Calumet & Hecla's two reclaiming suction - type dredges (one of which is seen here) is multiplied five times when they are made of chromium-nickel white iron

Pumps with these superior wearing parts have to be opened for inspection at much longer intervals, which is a big help in cutting maintenance cost.

Some typical dredge-pump casings and impellers, made of the nickel-chromium white iron, for 10-in. and 20-in. pumps, are shown in the rough in one of the illustrations. Another picture shows a new impeller of this material about to be installed in place of a worn one. The hardness of the chilled face of these parts is around 700 Brinell, approximately 40 percent higher than that of a good grade of chilled unalloyed white cast iron. Castings are cleaned up by breaking off the fins with a hammer. Where finish is necessary it is accomplished by grinding in lathe or boring mill.

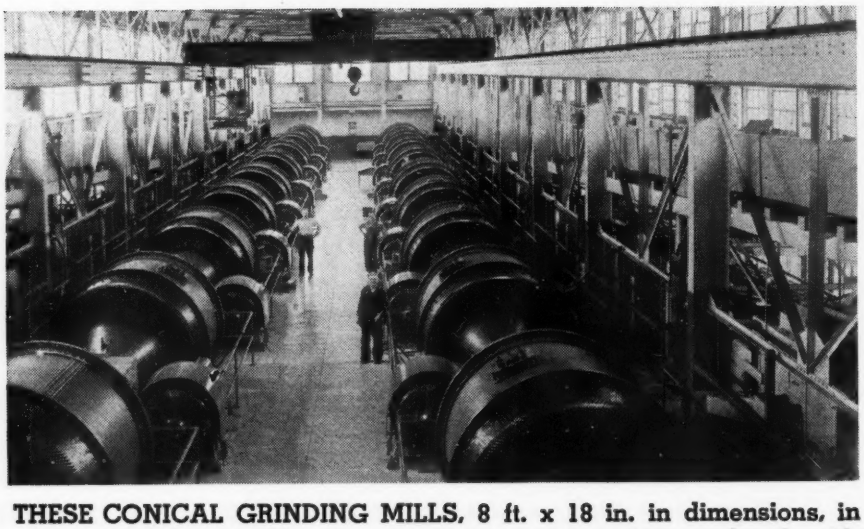
TWO IMPELLERS of Ni-Hard for a 20-in. dredge pump. The worn one, in the foreground, is being replaced by the new one standing behind it

Stamp-Shoe Life Longer

Stamp shoes working on amygdaloid ore weigh 850 lb. apiece and are 8½ in. thick originally. The average life of a Ni-Hard stamp shoe is 204 hours, compared with 128 hours for one of white iron. They are used until worn down to about 500 lb. in weight and 5-in. in thickness.

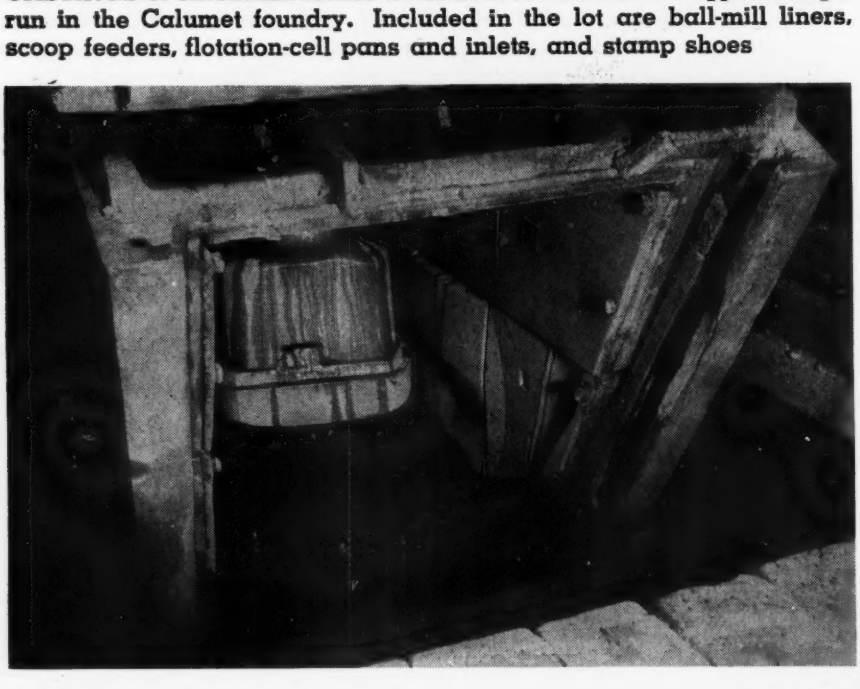
Mortar dies and liners also are of the nickel-chromium white iron. Though exact records are not available on the comparative life of these parts, the advantage of this material is greater than with the shoes. Average stamping rate is 811 tons per 24 hours.

One of the pictures shows the "working end" of a typical steam-driven stamp equipped with the nickel-chromium white-iron stamp shoes and mortars, in which the shoe life was 1.6 times that of the life of a shoe of the plain white iron previously used. Though the saving here is not as marked as in other applications, there



THESE CONICAL GRINDING MILLS, 8 ft. x 18 in. in dimensions, in one of Calumet & Hecla's concentrators have been relined with chromium-nickel white iron. Each requires 15,000 lb. of liners. The change has permitted a reduction of liner thickness from 2¾ in., used with ordinary white iron, to 2 in. Experiments with liner materials were run in these mills

CASTINGS of chromium-nickel white iron turned out in a typical day's run in the Calumet foundry. Included in the lot are ball-mill liners, scoop feeders, flotation-cell pans and inlets, and stamp shoes



STAMP SHOES of chrome-nickel iron give a life of 204 hours, compared with 128 hours for a plain white-iron shoe. They are used until worn down to 5 in. from a thickness of 8½ in. This view shows the mortar box of one of the steam stamps open with the shoe hung up

is a gain in stamping time and maintenance. Furthermore, the nickel-chromium white iron shoes are stronger, and breakage with consequent damage to other parts is less frequent.

Better Ball-Mill Lining

Sixty-four 8 ft. x 18 in. and eleven 8 ft. x 6 ft. Hardinge conical mills are used for fine grinding. The former require 15,000 lb. of the Ni-Hard liners each and the latter 27,000 lb. All liner segments are chill-cast. The bosses on the backs of the liner segments, seen in one of the photos, facilitate fitting the pieces in place in the mill and obtaining good backing. The ability to reduce liner thickness in the smaller mills from 2¾ in. with white iron to 2 in. with the nickel-chromium white iron results in increased mill capacity. In the large mills the 2¾-in. thickness is maintained to prevent breakage.

For grinding the conglomerate sand, which is highly abrasive, Danish and French pebbles had proved to be the most efficient media. They are very hard. With their disappearance, however, from the market at the beginning of the war it became necessary to use iron balls for grinding the conglomerate sand. Forged-steel and chilled-iron balls had both been used on the softer amygdaloid. Nickel-chromium white-iron balls seemed to be the logical substitute, and they were used long enough to demonstrate their value. Subsequently their use was discontinued because of fear of contaminating the copper in the sands, but they were entirely satisfactory as to grinding. Their wearing value as compared to chilled white-iron balls is approximately in the ratio of 2½ to 1.

Scoop feeders and the spiral shoes of Akins classifiers are now made of the nickel-chromium iron, and satisfactory results are expected. In Fahrenwald flotation cells impellers and pans of this material give about two years' life, compared with six to seven months when made of white iron.

Practically all castings are made with chills against the wearing side. Balls are cast in water-cooled copper molds.

Iron Ore Briquetting Process Patented

PATENTS COVERING a process of briquetting soft iron ores, concentrates, flue dust, or similar material, to produce a dense, compact product suitable for open-hearth or blast-furnace charging (U. S. Patent Nos. 2,331,074 and 2,336,618), have recently been issued to R. H. B. Jones, of the geological department of Oliver Iron Mining Co. This process, described in *E.&M.J.*, April, 1943, page 71, comprises drying the ore material and subjecting it to briquetting pressures sufficient to compress and compact it, and increasing the strength of the resulting briquets by heating them until they are case-hardened or incipiently sintered. An alternate process presses the fine dried ore into containers for furnace charging.

Experimental briquets have been produced which can be substituted for high-grade lump ore suitable for use as an oxidizing agent in the open-hearth furnace or for open-hearth charging. Those made from several different Mesabi Range ores withstand rough handling and have a specific gravity of 4 plus. They may also make a premium blast-furnace charge. Compared with loose Mesabi ores, they permit a freer circulation of the blast through the charge; dust losses which affect blast furnace capacity and efficiency are cut down; and the dense nature of the briquets permits delivery of a greater quantity of iron units to the hearth, thereby increasing production. Furthermore, dehydrated briquets require no drying in the blast furnace, whereas the moist Lake Superior ores require and use extra heat from within the furnace for this purpose.

The briquets described appear complementary to, rather than competitive with, sinter. The percentage of sinter in a blast furnace is usually limited by its porosity, which represents the opposite extreme to the smothering effect of soft Lake ores.

In the open hearth, sinter, unless weighted with scrap, is too light. Also, as an oxidizing agent, it does not have the desired oxygen content and usually contains unwanted carbon.

Finest ore sizes are best suited for briquetting. A large part of the Mesabi ores as mined will pass through 100-mesh screens. Concentrates finer than 100 mesh, such as from washing-plant tailings dumps, or possible future taconite concentrates, should make ideal briquetting material.

Giant Dragline Projected for Florida Phosphate Field

TO INCREASE THE PRODUCTION of phosphate rock at its Peace Valley mine, in the Florida pebble field, an 1150-B walking dragline, having a 20-cu.yd. bucket and a 215-ft. boom, has been ordered by International Minerals & Chemical Corporation from the Bucyrus-Erie Co. for delivery in approximately 12 months, according to Louis Ware, International's president. The cost will be about $550,000. This excavator will be the largest ever used in the phosphate industry and is as large as any in the world. A spur track will be built at the mine to the point of assembly.

In addition to the specifications given, the new machine will have a working weight of 2,300,000 lb., a dumping height of 80 ft., a dumping reach of 217 ft., a digging reach of 220 ft., and a digging depth of 130 ft. The 215-ft. boom will carry 25 cu.yd. of material at 180 ft., or 14 cu.yd. at 250 ft.

The 1150-B has a walking traction with a large-diameter circular tub or base, which gives it relatively low bearing pressure. The walking shoes are 48 ft. long by 8 ft. wide in dimensions.

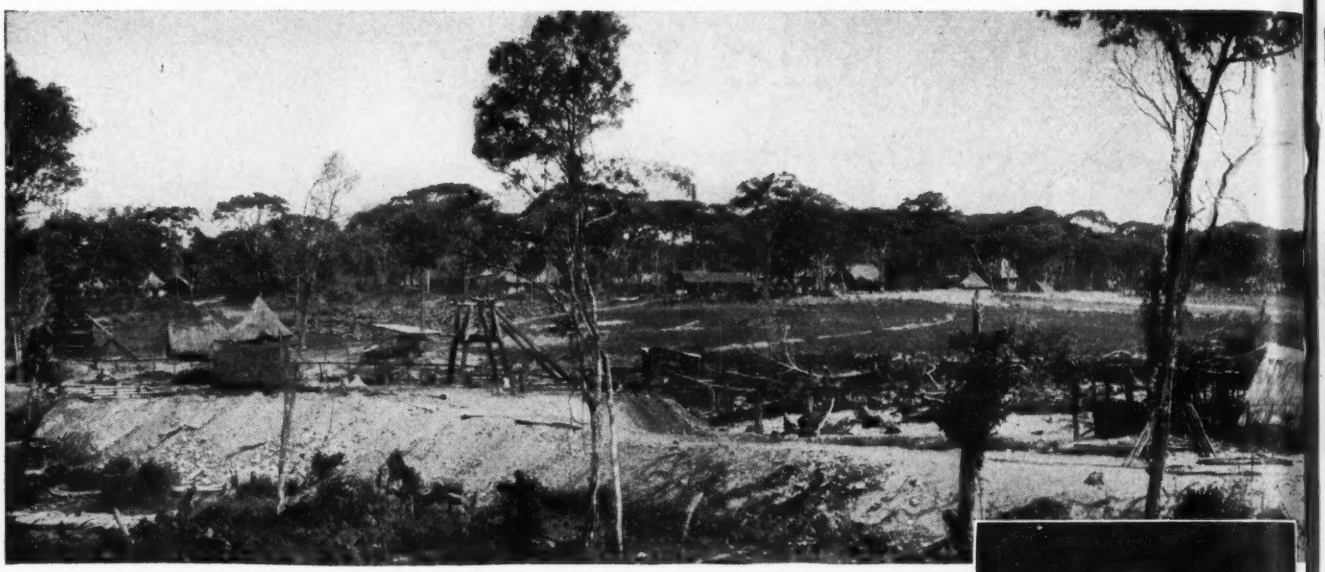
Electrical equipment includes two motor-generator sets, one with a 500-hp. induction motor and the other with a 1,250-hp. synchronous motor. All functions are independently operated by more than 30 motors, including two 425-hp. hoist motors; two 425-hp. drag motors; and three 125-hp. swing units. Air for ventilating the motors is first taken in through a ventilating room to filter it.

The ballast compartments are made large enough to use 250,000 lb. of sand and gravel, in place of scarce scrap iron.

The pebble phosphate field lies east of Tampa, the best-known portion centering at Mulberry, 40 miles or more from the Gulf Coast. Here at Mulberry are International's headquarters for its Florida operations, R. B. Fuller being resident manager. A general picture of these operations was given in the September 1940 *E.&M.J.*

The Peace Valley unit is on ground that is about one mile from Pembroke. Ground was broken for the new plant in December, 1941, and mining was started near by. The unit was described in *E.&M.J.* for September, 1942, two years later approximately, on pages 43 to 48. At that time two draglines were serving the mine. Both were electric, full-revolving, and of the track type. Stripping was done with a Model 360 Marion, having a 9-cu.yd. bucket and a 150-ft. boom. Matrix was dug with a Type 175 Bucyrus-Erie machine equipped with a 5-cu.yd. bucket and a 125-ft. boom. As elsewhere, matrix and overburden both vary here in thickness. The average depth of each, however, on the Peace Valley tract is 12½ ft., or I to I.

International has been operating in the Florida and Tennessee fields for more than 35 years and is the largest producer in the phosphate industry. Currently it is planning operation in 1944 of phosphate properties recently acquired in Montana. For years it has pioneered technological improvements in the mining of phosphate and in the oil flotation processes used in the industry. Franklin Farley is vice president in charge of the company's phosphate division.



How the Rhodesian Coppers Were Found

RAYMOND BROOKS, *Consulting Mining Engineer*

NORTHERN RHODESIA has become one of the most important copper-producing areas in the world, and engineers, as well as investors, should be interested in the story of how it began. Not a pound of the ore now mined to produce copper was known to exist in 1922. A few meager oxidized outcrops of limited extent were known, and three or four occurrences of oxide ores had been found some years before, but no copper operation of any kind was then under way.

The first evidences of the great sulphide deposits now being mined were found in 1923 and 1924 when an exploration company, Rhodesian Congo Border Concession, Ltd., financed in London, undertook to see if any important mineral deposits could be found.

It was a long shot and completely speculative when it started. The company was, however, backed by men of vision and courage and from the day of its inception there was no halting or change of purpose, even though newspapers and financial journals in England and South Africa were knocking it as a crude promotion scheme.

I remember a day in the second year of operations when I, as manager, called on the Governor of Northern Rhodesia at Livingston to ask his aid by furnishing natives to help cut motor roads in certain portions of the concession to make transportation less difficult. His reply was: "Mr. Brooks, I will base no part of our program for the development of Northern Rhodesia on the doubtful possibility of finding mineral deposits of importance." That attitude persisted until the exploration company, and the mining companies that were subsequently formed to work individual deposits, had proved beyond any question that mines of great importance had been found.

One or two individual government officials did give what assistance they could in furnishing native labor, building small bridges, and the like. Altogether, the Congo Border Co., or R.C.B.C. as it was always called, planned and cut over 600 miles of roads in the first four years.

The company started work in May, 1923, having secured exclusive prospecting rights for three years in an area of 52,000 sq.mi.—the entire northern portion of northwestern Rhodesia. It was an area the size of England, without roads or survey maps. One railroad crossed it on its way to the rich copper fields in the Congo, but the only active mine was the Broken Hill zinc-lead property, which was making slow progress.

The white population in Northern Rhodesia was about 7,000, made up of scattered farmers, government officials, railroad workers, traders, and missionaries. There were only three Europeans and perhaps 20 natives working on copper properties, and these were engaged in development at Bwana M'Kubwa mine, which had made several ineffectual starts at production. The mine turned out to be a flash in the pan, but it served a purpose in attracting attention while the big exploration job was getting under way. It is today abandoned as an operating mine.

Earlier Discoveries

Some attempts had been made in former years to find mines north of the Zambezi by the Bechuanaland Exploration Co., by the Northern Copper Co., and by the British South Africa Co., which had retained title to all of the minerals in both Northern and Southern Rhodesia. The former two and a few independent early pros-

N'CHANGA'S RIVER LODE workings where the first work was done to disclose the probable importance of the ore formations in Northern Rhodesia. In the distance at the right are the buildings that served as headquarters for Rhodesian Congo Border Concession, Inc. At the extreme left is the approximate location of the trench where W. C. Collier exposed a width of 140 ft. of 4½ percent copper ore

EXECUTIVES, engineers, and mining investors should give heed to the story told here for the first time by Mr. Brooks of the exploration work in which he played such an important part as manager of Rhodesian Congo Border Concession, Inc. In this and succeeding articles he drives home certain facts about finding mines that bear on the problem of developing new resources in various parts of the world to take the place of deposits now being depleted. At the same time he stresses the lack of interest and curiosity in these new discoveries that was exhibited by the major copper groups in the United States.

pectors had found occurrences of rather high-grade oxidized copper ore, and some small operations had been attempted, with little success. Among the Bechuanaland company's discoveries were Bwana M'Kubwa, just mentioned, and Roan Antelope. They were found by a prospector of English origin, William C. Collier, to whom belongs much of the credit for the proof of the importance of Northern Rhodesia as a copper country.

Bwana M'Kubwa was an obvious outcrop of oxide and carbonate ore somewhat similar to the occurrences in Katanga. One band of high-grade ore had been mined at surface.

Roan Antelope appeared at surface merely as a short series of narrow, dark-gray shale outcrops carrying a little malachite in knife-blade bedding seams—nothing to give promise of important sulphide deposits below. The Bechuanaland company did no work on Roan but held it for several years.

During that period of occasional prospecting, two other occurrences were found by independent prospectors, one near a small village whose head man was named N'Kana, and the other a few miles northwest and called Chambishi, from the name of a nearby stream. These properties were held by the discoverers. The limited outcrops at N'Kana were similar to those at Roan Antelope, and those at Chambishi were no more impressive.

One copper occurrence of considerable size had been found by George Gray at the turn of the century when he went north for Cecil Rhodes and Robert Williams. His route from Victoria Falls took him through a village of a chief named Kansanshi, just south of the present boundary between the Congo and Northern Rhodesia. Kansanshi showed Gray a nearby copper mine, to which Gray gave the chief's name. This was the first important copper deposit found in Northern Rhodesia. It had been worked extensively by natives, probably for generations. Here it was that Gray camped while two of his prospectors went ahead. Only a short time after this a native chief showed one of them the Star of the Congo mine, a deposit of almost unbelievably rich carbonate ore. About the same time other natives, 100 miles west of the "Star," showed Gray's men the Kambove mine. That was 40 years ago, but Kambove is still producing.

These and other discoveries in the Congo formed the basis for Tanganyika Concessions, Ltd., an English company headed by Robert Williams, of which George Gray was the first manager. The Kansanshi was included in Tanganyika's holdings, though little was done to develop it until 1928.

Prospecting Is Organized

The group that formed the Rhodesian Congo Border Concession Co. in London was composed of Minerals Separation, Ltd.; A. Chester Beatty, the well-known American engineer who resided in London and who has since become a British subject; Walter Broadbridge, an English engineer; and P. K. Horner, an American then living in London, who had been general manager of the Union Minière du Haut-Katanga, in the Congo.

Horner, who had just become consulting mining engineer for Minerals Separation, gets the credit for suggesting the idea of organized prospecting in Northern Rhodesia to see if deposits of the Katanga type of rich carbonate ores could be found on the British side of the boundary. The suggestion was considered favorably by Minerals Separation, which had engaged to design a plant for Bwana M'Kubwa on principles worked out by its consulting metallurgist, W. G. Perkins. Horner was then planning steam-shovel mining at Bwana.

As a start, in 1922, on recommendation of J. H. Curle, these men in London sent C. Gordon James, an English engineer, to Donaldson and Sivewright, in Johannesburg, who owned the N'Kana mine, to get an option on it. When this was obtained, application was made to the British South Africa Co. for an exclusive prospecting concession in an arbitrarily selected area of 2,000 sq.mi. surrounding N'Kana and extending east to the Bwana M'Kubwa holdings. This concession was obtained, and the group, including James, formed Copper Ventures, Ltd., afterwards known as C. V., Ltd. Enough money was subscribed to keep a manager, an engineer, and one white miner with some natives employed putting down prospect shafts on the strike of the meager outcrop at N'Kana, and to maintain two white prospectors and some natives for prospecting the N'Kana concession. In addition a contract was let for some shot-drill holes.

No sooner had this group formed

C. V., Ltd., than they decided they might as well get a real concession covering all the northern part of Northwestern Rhodesia for the length of the southern boundary of the Congo and extending to Angola on the west. It took much argument to get exclusive prospecting rights, but the chartered company finally agreed to a three-year period with a minimum guaranteed expenditure. In addition to royalties, they provided the right to a fixed participation in anything found and floated as a separate company.

Opposition to this concession arose in Africa, where a yell went up from individual prospectors and government officials because of closing such an area to independent search and pegging. Actually, I think, time has proved that it was a wise move for everyone concerned, because not one of the mines that are now producing copper could have been proved or developed by independent miners, and, in all probability, would not have been found for years. If capital in very large amount had not been provided through stock companies to drill and explore extremely unpromising and meager evidences of mineralization, there would probably be no copper today from Northern Rhodesia to supply its quota for the great war need.

Roan Not Included

Here it should be said that the Roan Antelope property did not enter into the early explorations and plans of either R.C.B.C. or C. V., Ltd. It was near the southern boundary of the N'Kana concession and within the Congo Border boundaries, but because title was held by another company there was no reason for either of the new companies to investigate it. N'Kana outcrops looked as good as the Roan, and the owners had done a little shaft sinking that gave it greater appearance of possible importance. Moreover, the R.C.B.C. management had its hands full hunting for possible deposits in its own great area.

Ore outcrops at Chambishi were practically non-existent, but the owners had done a little trenching that exposed measures of oxidized sedimentary formation carrying copper. They showed the same type of low-grade oxide ore that had discouraged the owners of Roan and N'Kana.

The N'Changa Find

The Congo Border company did do some trenching on Chambishi in 1923, when it was thought that the titles of the location had lapsed, but left it to investigate its own new discovery at N'Changa further west. That decision in October, 1923, started things, and it was not long before Bill Collier had put a trench down through a swamp at N'Changa to 14 ft. depth and exposed a width of 140 ft. of 4½ percent oxidized copper ore.

This exposure of commercial ore on an original discovery of the Rhodesian Congo Border company created the first confidence in the real possibilities of Northern Rhodesia. The cable to the Board in London at the end of 1923, announcing it, was good news indeed to the men who had to raise the capital.

Interest Awakened

Ultimately this "River Lode" proved to be a separate segment of the main ore beds, on the opposite limb of a syncline, but the discovery served to stimulate confidence and was the primary cause of an awakening of interest in older properties like Roan Antelope, N'Kana, and Chambishi. This and other subsequent developments at N'Changa led, in 1926, to the formation, by Sir Edmund Davis and associates, of three other huge concessions in Northern Rhodesia, totaling 135,000 sq.mi. Three companies were formed to explore them: Kasempa Concessions, Ltd., Loangwa Concessions, Ltd., and Serenji Concessions, Ltd., the three being later merged into the Loangwa company, although initial separate organizations started the work in each along the lines that were proving effective in the R.C.B.C.

One other digression from the history of the Congo Border company is necessary to tell of the first discovery of the meager outcrops and copper showings at Mufulira, the other great mine of that region. In June, 1923, just as we were organizing the prospecting in the R.C.B.C. concession, I was also put in charge of development at the N'Kana property and of prospecting the N'Kana concession. Headquarters of R.C.B.C. were set up at N'Kana mine, so the work in that area was easily supervised. Two experienced prospectors named Moir and Bell, with a crew of natives, were sent out to work up the west side of the Kafue River to the Congo boundary and then to return on the east side. Nothing of consequence was seen going north, but on their way south they were camped near a small tributary called the Mufulira. Here they found a small amount of malachite precipitated on peat moss and sent a sample of it to me at headquarters. Shortly afterwards they discovered the limited outcrops showing meager copper-carbonate stains. Horner and I went there and saw the outcrops, but we had adopted the policy of keeping prospectors on the move during the dry season and sending a "follow-up" man to do work on any encouraging discoveries.

Bwana Gets N'Kana

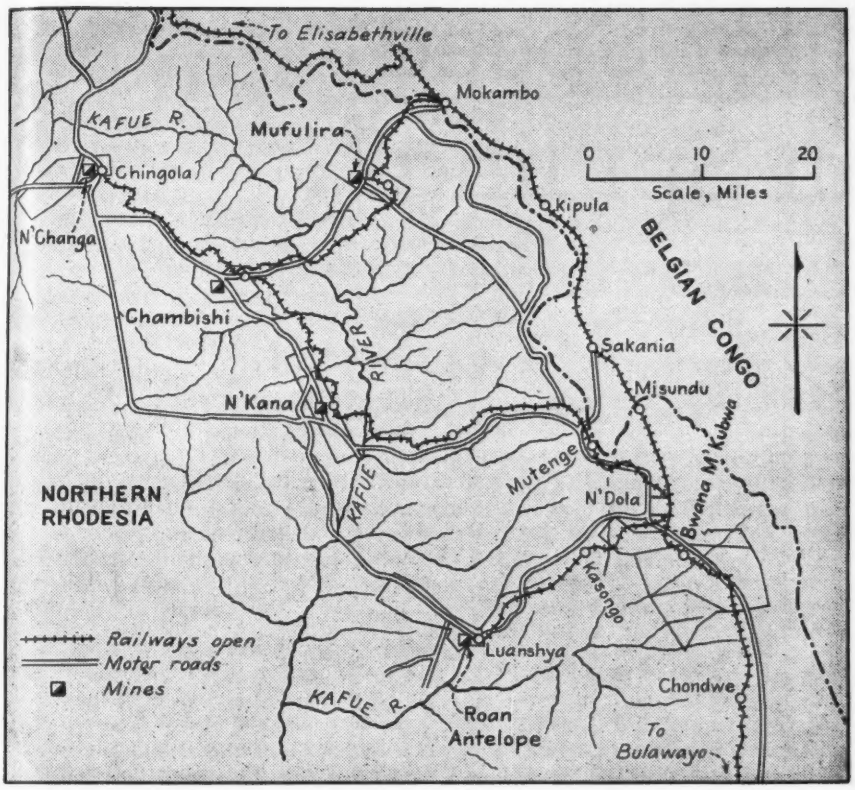
Before anything more could be done at N'Kana mine or on the N'Kana Concession, C. V., Ltd., in London in December, 1923, made a deal whereby its rights under the concession and its option on the N'Kana mine were sold to Bwana M'Kubwa. I imagine the members of the C. V. syndicate have since regretted the sale. They had invested little money and were, had they been able to look ahead, in a position to control both N'Kana and Mufulira. Subsequently Rhodesian Selection Trust made an arrangement with Bwana M'Kubwa by which it took over the prospecting of the N'Kana concession, thereby ultimately disclosing the sulphide orebodies of Mufulira and gaining control.

After N'Kana was sold and important ore finds had been made at N'Changa it was decided to move R.C.B.C. headquarters to a point in our own territory where we would be closer to prospecting parties working further west. A road was cut from N'Kana to a point 55 miles away, where headquarters for R.C.B.C. were established in March, 1924.

New Centers of Activity

From then until 1926 N'Changa and M'Kubwa were the two centers of copper development activity in Northern Rhodesia. Investigation of the Roan had not started, and a limited program was under way by the Bwana M'Kubwa company at N'Kana under direction of C. O. Wraith, an English engineer who had been employed by C. V., Ltd. This drilling program in the bush, along the northwesterly strike of the copper-bearing beds at N'Kana that had been exposed by C. V., Ltd., finally disclosed a better grade of oxidized ore, and, ultimately, the sulphide mineralization on the dip at greater depth. The present N'Kana workings are nearly two miles on the strike from the original outcrops.

To show that Bwana M'Kubwa and the discoveries at N'Changa were the stimulating influences that started things going in Northern Rhodesia and awakened interest in the older locations like Roan, N'Kana, and Chambishi, it should be noted that all of the visiting engineers of that period were sent by their principals to see these two mines before starting explorations at other points.



THIS MAP of the Rhodesian-Congo Border region, drawn some years later than the period discussed by Mr. Brooks, serves to show the relative positions of the important properties discovered

R. J. Parker at Roan

From then on, credit for developments at Roan Antelope and Chambishi mines goes, without reservation, to Russell J. Parker. He did a real job of pioneering development at the Roan under difficult conditions and the results played a large part in increasing the momentum which ultimately established Northern Rhodesia as the third largest copper-producing area in the world.

Again, and entirely for historical reasons, it should be said that Thorold F. Field, who examined the Roan for the American capital in late 1926, saw that mine at a time when Parker had exposed the great sulphide beds and shown beyond doubt that an important copper deposit had been found. To Field goes credit for prompt recognition of the importance of the discovery, and for immediately recommending a substantial financial participation to his American principals, though Parker had already reported similar views to his principals. Field, like four or five other well-known American engineers who had visited the country the previous year, did not visualize the possibilities of the copper-bearing formations then being investigated at N'Changa with trenches and diamond-drill holes. The "dambo lode" had been extensively trenched, showing a big width of flatly dipping oxidized sedimentary beds carrying about 1½ percent copper, but the 3½ and 4½ percent sulphide ore that occurred deeper on the dip had not yet been exposed.

N'Changa's Huge Reserves

One of these engineers stood with me on the edge of a trench and remarked that we would not find a copper mine there because no deposits of commercial importance had ever been developed anywhere in a similar formation. Three other very well-known copper men from the United States visited N'Changa for a day, and left with the same impression. In fact, their entire conversation when looking at our work was about the dangers and likelihood of being bitten by tsetse flies and contracting sleeping sickness. One of the three, in writing up the Rhodesian trip for publication afterwards, described a picnic lunch I had furnished to eat by the roadside en route to N'Changa, listing in detail the various countries that had provided the canned goods, but not mentioning the copper showings at N'Changa.

Published estimates give reserves at N'Changa 128,375,000 tons of ore averaging 4.66 percent copper.

Methods Used Effective

My statements are made to try to bring home to miners, engineers, and mining investors certain facts about finding mines that have an important bearing on the problem of discovering and developing new resources of metals in various parts of the world to take the place of deposits that are now being depleted. It is an important question, and I hope I make it clear in this account that nothing is intended to be needlessly controversial, because systems of search have to be selected that best suit conditions. In Rhodesia there were few rock outcrops, and we had to make the best of very minor evidences of mineralization. In the case of Rhodesian Congo Border Concessions, the methods employed to find mines were, perhaps, old-fashioned, but they were effective. I am simply stating a fact when I say that the Congo Border company had no geological department during the first three years of exploration work, in which period 141 different new discoveries of ore occurrences were made. One young American geologist, named H. E. Latendressee, was employed by us in Africa in 1924; also one English engineer who had studied geology.

In 1926 the directors in London finally acceded to my repeated requests for an appropriation for a small geological department which we wanted so as to make detailed studies of the deposits we were finding. Louis E. Reber, Jr., was borrowed from United Verde Copper Co. to head it.

Anglo American Enters

The Anglo American Corporation, which had taken a financial participation in R.C.B.C. and Bwana M'Kubwa on recommendation of its consulting engineer, Carl R. Davis, also an American, concluded, in 1926, to back the Rhodesian enterprises with its full strength. Thus for the first time, Minerals Separation, Chester Beatty, and associates obtained the necessary assistance to carry forward explorations and development on the required scale. With the arrangement for financing there was an agreement that Anglo American would serve as managers of the Loangwa, Serenji, and Kasempa concession companies, and as technical managers for R.C.B.C., Bwana, M'Kubwa, and Rhodesia Broken Hill.

R.C.B.C.'s effective prospecting methods, and the underlying theory, will be discussed in the June issue by Mr. Brooks; likewise the surprising indifference of the great American copper groups to the new discoveries.

What Tripper Speed for Uniform Spilling?

R. F. EMERSON, *General Electric Co., Schenectady, N. Y.*

AT A WESTERN MINE, where the ore hoisted varies considerably in quality, it is mixed on the stockpile before being sent to the smelter. This is done by a tripper which travels alternately back and forth along a conveyor belt, spilling the ore off onto the pile beneath the belt.

Both belt and tripper are motor-driven. The belt is driven by a 50-hp, 1,200-rpm, constant-speed, squirrel-cage motor, and the tripper is driven by a 15/7.5 hp, 1,200/600-rpm, 2-speed, squirrel-cage motor. This installation was engineered by Robins Conveyors, Inc., of Passaic, N. J.

To cause the tripper to spill the same amount of ore when traveling with the belt as when traveling against it, it was necessary to compute the relative operating speeds of both belt and tripper. Only in this way, it was felt, could the desired uniformity be obtained. Once ascertained, moreover, this information would largely determine the types of motors and related equipment required.

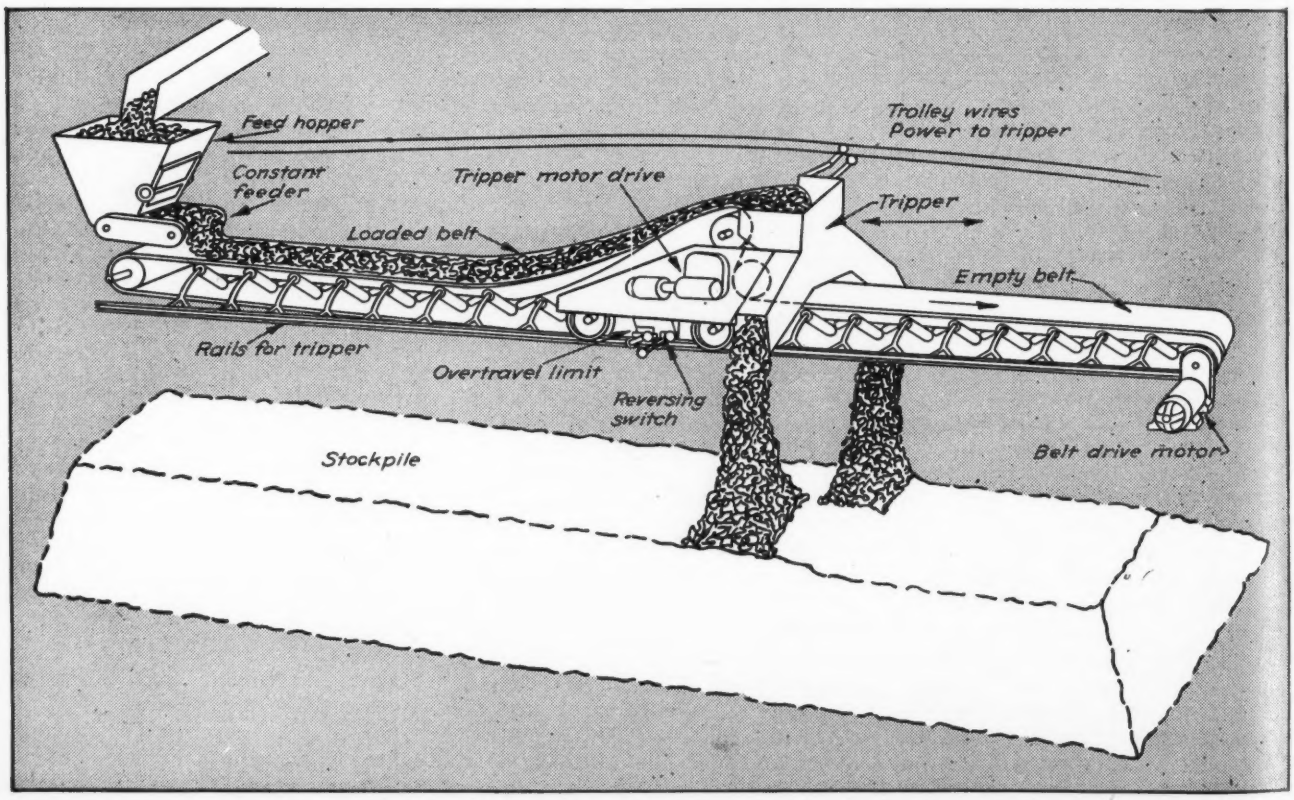
In working out the problem, the following symbols were used:

W	Pounds of ore per foot of belt
L	Length of ore pile in feet
V_C	Speed of conveyor in fpm.
V_R	Speed of tripper going to right, or in same direction as belt
V_L	Speed of tripper going to left, or against motion of belt
WL	Amount of material on belt

Acceleration and deceleration periods at each end of the belt were disregarded, inasmuch as this would have little effect over an ore pile several hundred feet long.

In this installation, the ore is delivered in uniform quantities to the conveyor belt by an ore feeder as the belt runs at a constant rate of speed from left to right. Consequently, the question arose as to what should be the speed of the tripper when traveling first to the right, or with the motion of the belt, and then to the left, or against the motion of the belt.

Obviously more time should be consumed by the tripper when traveling with the motion of the belt, since not all the ore delivered to the belt during this journey of the tripper is spilled on the ore pile. We are interested only in what is spilled on the ore pile.



RELATIVE OPERATING SPEEDS of conveyor and tripper must be computed so that the tripper will spill the same amount of ore when traveling with the belt as when traveling against it

The curve in the graph shows that for a 2/1 motor-speed ratio, the speed of the tripper while traveling to the right must be one-quarter the speed of the belt, and while traveling to the left, one-half the speed of the belt.

While the tripper is making one journey to the left (see cut) it clears off the ore that was on the belt. Then, since the belt moves twice as fast as the tripper, sufficient time elapses for the feeder to deliver two more loads to the belt while the tripper is completing its journey. All three loads have been swept off the belt by the time the tripper reaches the feeder. In short, three loads have been spilled, from right to left, in one layer on the ore pile.

While the tripper is moving to the right, the feeder delivers four loads to the belt, but when the tripper completes the journey, one load is still on the belt. This makes a net of three loads spilled, from left to right, in one layer on the pile. Hence the same amount of material is spilled during each of the tripper's journeys.

We will first consider the amount of ore spilled when the tripper starts at the left and journeys toward the right with the motion of the belt. The ore spilled by the tripper then will be

$$WL\frac{V_c}{V_R} - WL$$

and the amount spilled will be the same as the amount deposited on the belt by the ore feeder, minus what is left on the belt.

The belt is loaded with ore (WL) when the tripper arrives at the extreme right, and this amount is added. Therefore we have

$$WL\frac{V_c}{V_L} + WL$$

representing the amount which will be spilled equal to what was spilled while the tripper was journeying to the right. Or, Equation 1:

$$WL\frac{V_c}{V_R} - WL = WL\frac{V_c}{V_L} + WL$$

The above equation becomes Equation 2:

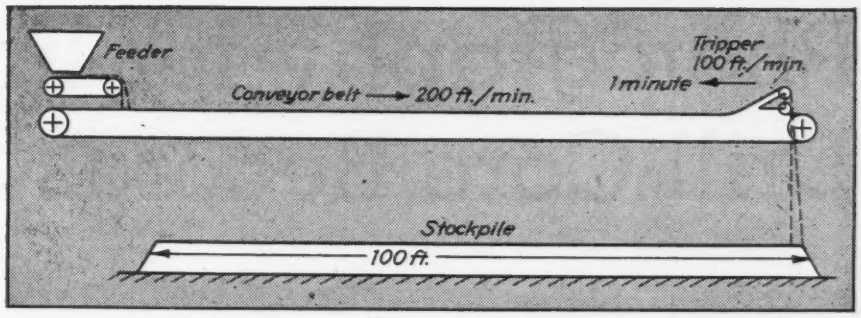
$$\frac{V_L}{V_c} = \frac{r-1}{2}$$

where r equals ratio of

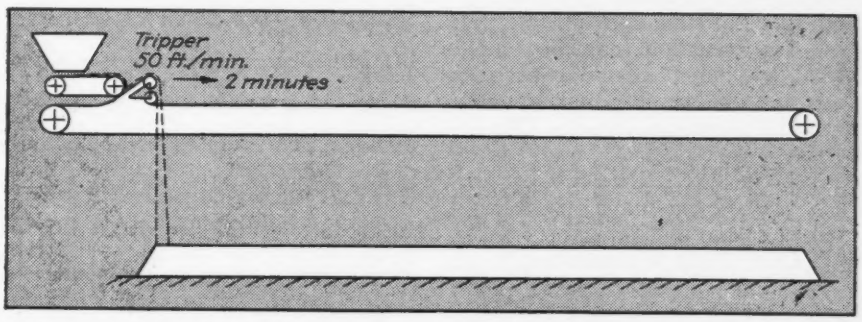
$$\frac{V_L}{V_R}.$$

The curve in the graph is based on Equation 2, and is a straight-line function, indicating that a single-speed motor could not be used for driving the tripper.

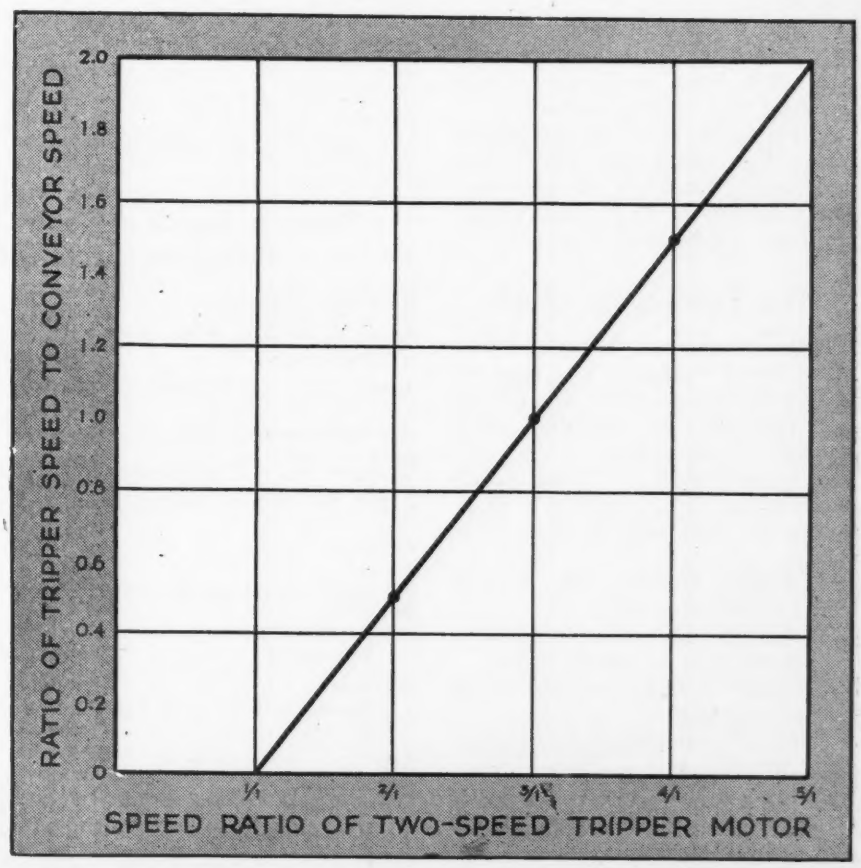
Relative speeds for other than 2:1 motor speed ratios are also indicated.



WHILE THE TRIPPER is making one pass to the left at 100 ft. per minute over an ore pile 100 ft. long, in one minute the load already on belt and two like loads from the feeder, or three loads in all, are spilled onto the pile beneath



TO SPILL THREE LOADS in one pass to the right onto the ore pile 100 ft. long will require two minutes with the tripper moving at 50 f.p.m. Four loads will be fed, one remaining on the belt. Conveyor speed and direction are the same as before



SPEED OF TRIPPER traveling to right must be one fourth of the belt speed. Traveling left, the tripper must move at one-half the belt speed

Photography for Improving Drill-Core Records

CHARLES A. DOBBEL, *Associate Professor of Mining, Stanford University, Palo Alto, Calif.*

With the camera a permanent record can be made of the aspect presented by each piece of drill core to the human eye, so that, even in the absence of the core itself, the record may be re-studied, possibly years afterwards and in the light of later knowledge of the rocks drilled. The record's value is increased if color photography be used, but black-and-white pictures are also effective if properly taken. How to do this is told by Mr. Dobbel, following his discussion last month.

TO MAKE EFFICIENT USE of photography to the end of improving the record kept of diamond-drill core, certain fundamentals must be realized:

1. The operation must be simple, quick, and sure. Even a beginner must be able to turn out a usable result in minimum time. This requires: (a) Standard, easily set-up equipment. (b) Standard lighting. (c) Standard exposure. (d) A minimum of fuss in processing.

2. Detail must be delineated; hence a good lens of not too long a focal length is necessary, so that the detail of the fractured surface of the split core with its inherent roughness can all be photographed as a single plane. That is, the lens must have sufficient depth of focus when focussing close to object.

3. Actual size reproduction is necessary, since actual size conveys a picture much more clearly than an exaggerated or a reduced scale.

4. Economy must be considered, inasmuch as added value can be realized with a multiple of exposures. The possibility of great value of color film must not be overlooked.

The Equipment Used

Many cameras may be rigged up for a standard 1:1 set-up. The most fitting are the various miniatures, due to:

1. Economy of operation with standard 35 mm. film.

2. Large number of exposures with one loading. Usual capacity is 36 exposures in black and white or 18 in color.

3. Readily available film in both color or black and white.

4. Available equipment to adapt for 1:1 reproduction in several makes.

5. Range of shutter speeds to suit available lighting.

6. Good lenses and precise construction, which insure foolproof results with little bother. Short-focus lenses are standard which give greater depth at a given diaphragm opening.

7. Processing in standard tanks designed for 35 mm. film is very simple.

8. Sufficient size of picture to illustrate changes in core when full-size reproduction is utilized (1x1½ in.).

9. Compactness helps portability.

In this work, I have used the Leica camera with the standard 1:1 ("Belun") attachment. No polishing is necessary and all core pictures made have been taken of the rough surface as split by the standard core-splitter. (Some were shown in my article in *E.&M.J.*, April, 1944.)

A cable release should be provided to avoid jarring the camera during exposure. Two ¾-in. or 1-in. surfaced blocks are necessary to raise the camera set-up high enough to accommodate the specimen of core and place its surface in the plane of focus, as shown.

The standard Leica "Elmar" 50 mm. lens has been used with this equipment. A medium-speed panchromatic film is recommended for general use, as it is fast enough to give a short exposure, has fine-grain quali-

Table I. Depth of Focus Table: Elmar 50 Mm. Lens Based on Circle of Confusion 1/30 Mm.

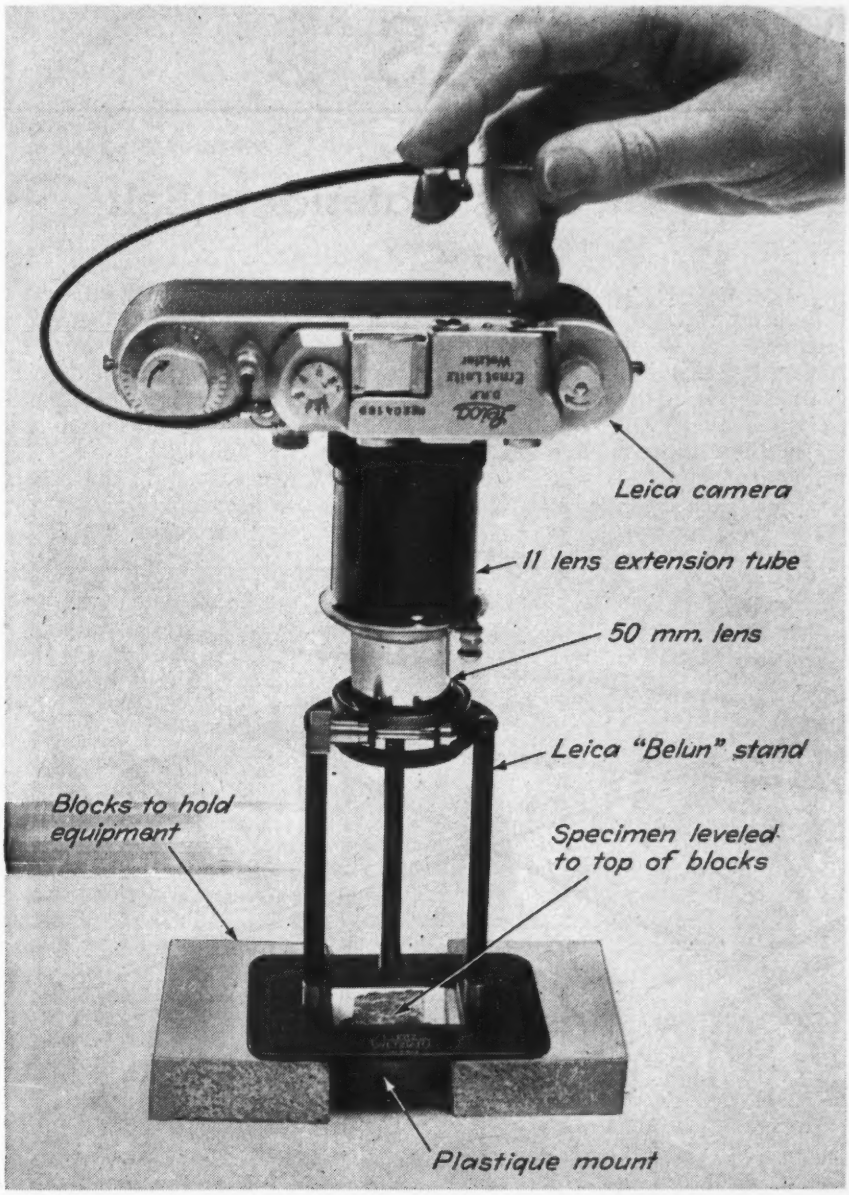
Diaphragm aperture	f 6.3	f 9	f 12.5	f 18
Range of depth of focus (when reproducing 1:1)	0.84 mm.	1.20 mm.	1.67 mm.	2.40 mm.

Area covered: (as indicated by opening in base plate of 1:1 attachment): 24 × 36 mm. or 1 × 1 3/8 in.

Table II. Suggested Exposures with 1:1 Attachment, One 60-Watt Mazda Lamp at 10 Inches from Specimen:

Film:	Aperture 6.3	9	12	18
Dupont:				
Superior I	1/5 sec.	1/2 sec.	1 sec.	2 sec.
Superior II	1/10 sec.	1/5 sec.	1/2 sec.	1 sec.
Eastman:				
Panatomic X	1/5 sec.	1/2 sec.	1 sec.	2 sec.
Plus X	1/10 sec.	1/5 sec.	1/2 sec.	1 sec.
Agfa:				
Finopan	1/5 sec.	1/2 sec.	1 sec.	2 sec.
Supreme	1/10 sec.	1/5 sec.	1/2 sec.	1 sec.
F. G. Plenechrome (*a*)	1/2 sec.	1 sec.	2 sec.	4 sec.
Color:				
Kodachrome A	1/4 sec.	1/2 sec.	1 sec.	2 sec.

(*a*) F. G. Plenechrome is orthochromatic film.)



EQUIPMENT FOR PHOTOGRAPHING drill-core samples set up ready for work. Note that the specimen is placed on a plasticine pad and leveled even with the top of the blocks, so that its surface is in the plane of focus

ties, and sufficient contrast for almost all samples. With some sulphide minerals a less red-sensitive film would be advisable, so orthochromatic film might be found better under some conditions. The faster panchromatic films will give shorter exposure time, but more grain in the film is to be experienced, which at times is not advisable, especially with specimens having a granular appearance. Table II gives the most popular brands.

Once the equipment is assembled and the exposure and diaphragm-setting are determined, exposures can be made as fast as specimens can be replaced on the plasticine mount. With constant illumination and one loading of film, no further manipulation is required for obtaining 36 exposures.

As mentioned, with a good 2-in. (50-mm.) lens, there is sufficient depth of focus with 1:1 reproduction to take care of variations in the specimen face, so that the broken face appears in the picture in a single plane, all sufficiently in focus. As noted in Table I, the smaller the diaphragm opening the greater depth of focus. It is advisable to use stop f 9 or smaller.

Procedure

The first step is to eliminate the variable factors of light, film used, exposure, etc. Once determined and standardized, all subsequent record can be made without change in routine. The steps to be followed are as noted: (1) Set up camera with 1:1 fixed attachment. (2) Set specimen in supporting blocks. (3) Set lens aperture. (4) Set exposure time. (5) Wind film to position for first exposure. (6) Set camera on supporting blocks. (7) Make exposure. Subsequent exposures are made by repeating steps 2, 5, 6, and 7.

Processing the Film

Black-and-white film of 35 mm. size can be processed in the field in any of the standard 35 mm. tanks. A darkroom is not necessary. A sleeping bag answers for the one operation which calls for darkness—changing the film from the film spool to the tank. The actual processing is simple and standardization is easy.

By processing the negative in camp, retakes can be made if necessary, although failure should not result after a trial or two, to standardize the procedure. The negative film can be mailed out for prints or can be used directly to give a record of the drill core. One roll of 36 exposures (mailing weight about 2 oz.) will ordinarily cover the changes in 300 ft. of drill hole. At bulk rates ($6 per 100 ft.) for negative film, these negatives cost less than 1c. each (8 negatives per foot). Prints are even more reasonable, and, if made in strips of 4 or 5, can be had commercially for 4 or 5c. per strip, or about 1c. each. Hence, a pictorial record costs about 25c. per 100 ft. of hole.

Positive prints can be made on positive film instead of photographic paper. This sells for around 2c. per foot. It has the advantage of giving a contact print in actual size.

Record in Color Startling

The message that drill core conveys can be taken in actual color on Kodachrome film by using kodachrome loads instead of black-and-white films. Results of records in color are startling, almost placing the actual core before one's view. In fact, a good sight-determination mineralogist could easily identify all common minerals in such a slide. Cost, however, is a factor. Eighteen exposures cost around $2.50 per roll in the 35 mm. size. These are processed by the manufacturer, and generally are returned in a week.

It is important in making exposures with a 1:1 set-up (with picture in actual size) to realize that a normal photographic exposure must be increased four times.

OPERATING IDEAS

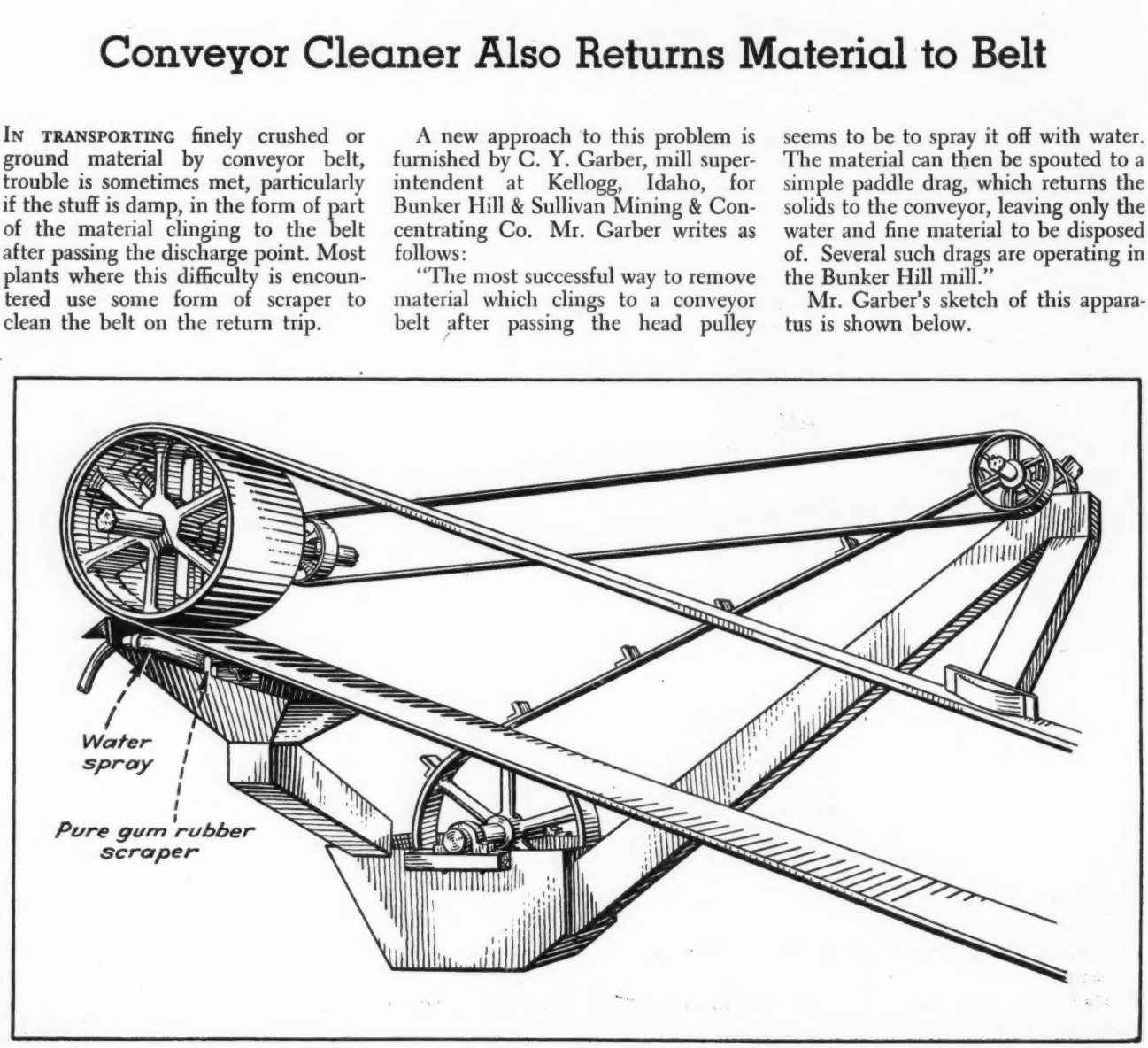
Conveyor Cleaner Also Returns Material to Belt

IN TRANSPORTING finely crushed or ground material by conveyor belt, trouble is sometimes met, particularly if the stuff is damp, in the form of part of the material clinging to the belt after passing the discharge point. Most plants where this difficulty is encountered use some form of scraper to clean the belt on the return trip.

A new approach to this problem is furnished by C. Y. Garber, mill superintendent at Kellogg, Idaho, for Bunker Hill & Sullivan Mining & Concentrating Co. Mr. Garber writes as follows:

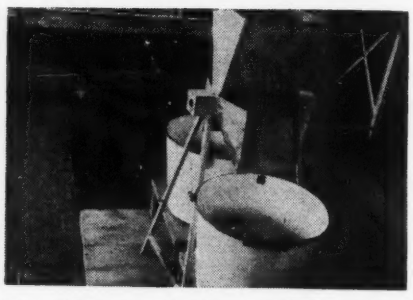
"The most successful way to remove material which clings to a conveyor belt after passing the head pulley seems to be to spray it off with water. The material can then be spouted to a simple paddle drag, which returns the solids to the conveyor, leaving only the water and fine material to be disposed of. Several such drags are operating in the Bunker Hill mill."

Mr. Garber's sketch of this apparatus is shown below.



A Jones Riffle for Sampling Wet Pulps

TO INSURE ACCURACY in cutting down a bucket sample of wet pulp, Malcolm Black, mill superintendent for Wright-Hargreaves Mines, Ltd., Kirkland Lake, Ont., had the machine shop build him a Jones riffle made out of a 2 x 2-in. solid steel bar with slots $\frac{1}{8}$-in. wide cut in it $\frac{1}{4}$-in. apart, center to center. Sheets of tin plate were welded to this to provide the hopper above and the supports below, to turn out the completed riffle shown in the photograph.



A solid steel bar, 2x2-in. was slotted to form this sample splitter

To cut down a sample the entire bucketful is dumped through the riffle carefully after stirring the contents. Sampling a bucket of wet pulp by dipping is often inaccurate because of failure to stir the pulp sufficiently. To dump a sample through the riffle the pulp must be well stirred.

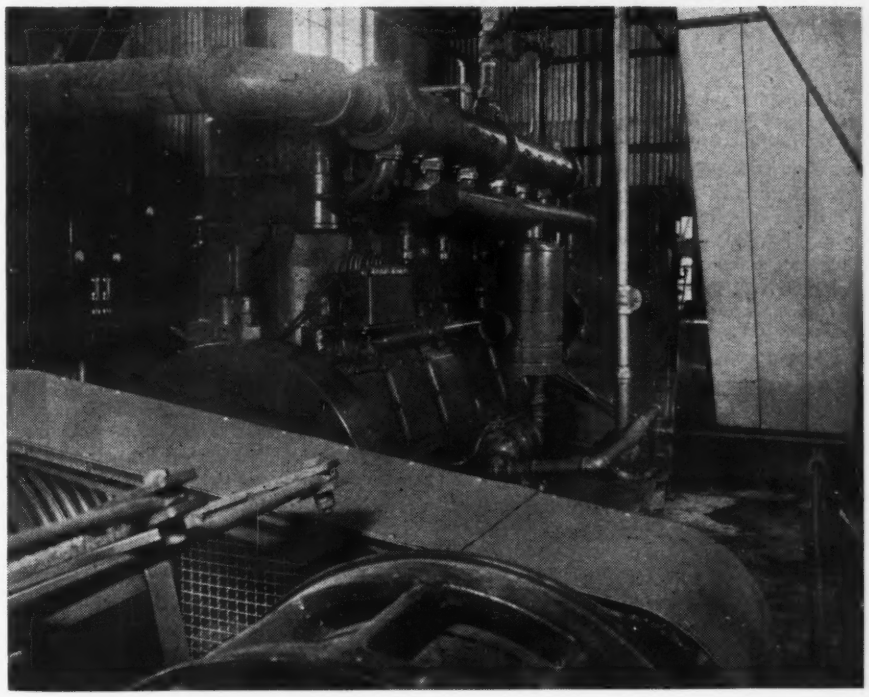
A riffle with such small spacing could not be built accurately from metal sheets, if at all. In addition, the splitter, as machined from solid bar stock, is extremely rugged.

Belt-Drive Guards Prove Easy to Build

V-BELT and flat belt drives on board the gold dredge of Western Dredging Co. at John Day, Grant County, Oregon, are protected by the shop-built guards shown in the accompanying photograph. Power for the dredge is supplied by the two Atlas Imperial diesel engines shown, which drive a generator and are also directly connected to the bucket line, the ladder hoist, and the swing winches. The screen and the stacker belt are powered by electric motors.

The guard for the V-belt drive was built by constructing a framework of 1¼ x 1¼ x 1¼-in. angle iron, bent at the ends to conform to the sizes of the engine pulley and the generator pulley. The curves were developed by cutting wedges out of one side of the angle irons with a hack saw, then bending them to shape, then welding up the joints with the arc.

The framework was covered with 20-gage sheet stock, cut out with a hand shears and fastened to the frame with ¼-in. stove bolts put through holes drilled with a light electric drill in sheet and frame simultaneously. The outer part of the guard consists of 1-in. square mesh screen, put on to provide air circulation and allow easy belt inspection.



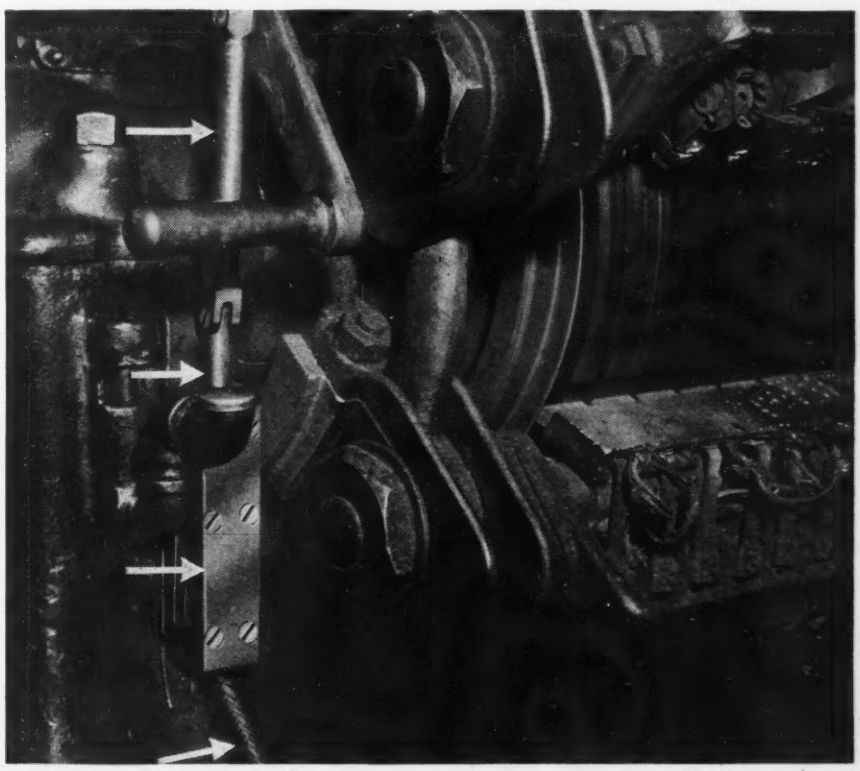
The flat belt driving the bucket line, visible in the background, was protected on the under side by a guard made of select planking. The sides and top of this guard were made of ⅞-in. boards, arranged in sections.

Safety Switch For Starting Rotary Converters

NUMEROUS rotary converters with manual controls have suffered damage by closing the main circuit breaker to apply the load before the brushes are lowered. In addition the man who is doing the starting may be injured if it happens in this incorrect sequence of starting that the load should change from light to heavy at the time he is lowering the brushes. Such a coincidence could cause a bad flashover.

To prevent these possibilities of equipment damage and personal injury, E. A. Richard, chief electrician of the Weeksbury, Ky., mine of Koppers Coal Division, Eastern Gas & Fuel Associates, devised a switch operated by the brush-raising lever, or crank, and has used it on each converter.

The contacts of this switch are in series with the holding coil of the manually-closed overload circuit breaker. As indicated by the illustration, the contacts are housed in a fiber box attached to the bearing pedestal. The connecting rod from this box to the brush lever has a pivot joint so that the switch plunger proper is not tilted sideways as it is moved up and down.



MARKET SUMMARY

WITH CONSUMPTION OF METALS holding at top levels, and the manpower problem at mines, smelters, and refineries growing more serious and actually reducing output, tension in the market over the supply situation has not eased. Unless demand diminishes, there is a strong possibility that the emergency stockpiles will be reduced in size this year. However, there is no fear of shortages in so far as war demands for copper, lead, zinc, and tin are concerned. The light metals are in sufficient supply to reduce output further. In reference to aluminum, delivery of 100,000,000 lb. by the Canadian producer has been deferred to 1945. Labor representatives urged that imports be curbed to maintain domestic production and prevent additional unemployment in the aluminum industry.

Price changes during April included a reduction in the quotation for quicksilver, and an upward adjustment in brass and bronze ingots to offset higher costs. OPA sanctioned adjustable pricing agreements on sales of iron ore produced in Minnesota, Wisconsin, or Michigan, pending final action on requests made for higher prices this season.

Deliveries of copper to domestic consumers during March amounted to 156,083 tons, the third largest on record. About one-third of this tonnage consisted of copper produced outside of the United States. The April deliveries also are expected to be large, and little slackening in activity is anticipated for the month of May. Metal that was added to the reserve supply during January and February has been largely withdrawn to fill the extraordinary needs of consumers. Authorities believe that the so-called stockpile has been reduced to a figure somewhat below 290,000 tons.

The price of chemical lead has been revised by St. Joseph Lead Co., effective June 1, to cover the full premium allowed by OPA, which is $2 per ton above common. This was done to divert more business to common lead. Domestic consumption of refined lead has been holding at around 65,000 tons a month. To meet this demand, the Tin-Lead Division of WPB has been releasing more than 15,000

Major Metals

U.S. DAILY AND AVERAGE PRICES

1944	Electrolytic Copper		Straits Tin	Lead		Zinc
	Domestic	Export	New	New		
April	(a) Refinery	(b) Refinery	York	York	St. Louis	St. Louis
1	11.775	11.700	52.000	6.50	6.35	8.25
3	11.775	11.700	52.000	6.50	6.35	8.25
4	11.775	11.700	52.000	6.50	6.35	8.25
5	11.775	11.700	52.000	6.50	6.35	8.25
6	11.775	11.700	52.000	6.50	6.35	8.25
7	11.775	11.700	52.000	6.50	6.35	8.25
8	11.775	11.700	52.000	6.50	6.35	8.25
10	11.775	11.700	52.000	6.50	6.35	8.25
11	11.775	11.700	52.000	6.50	6.35	8.25
12	11.775	11.700	52.000	6.50	6.35	8.25
13	11.775	11.700	52.000	6.50	6.35	8.25
14	11.775	11.700	52.000	6.50	6.35	8.25
15	11.775	11.700	52.000	6.50	6.35	8.25
17	11.775	11.700	52.000	6.50	6.35	8.25
18	11.775	11.700	52.000	6.50	6.35	8.25
19	11.775	11.700	52.000	6.50	6.35	8.25
20	11.775	11.700	52.000	6.50	6.35	8.25
21	11.775	11.700	52.000	6.50	6.35	8.25
22	11.775	11.700	52.000	6.50	6.35	8.25
24	11.775	11.700	52.000	6.50	6.35	8.25
25	11.775	11.700	52.000	6.50	6.35	8.25
26	11.775	11.700	52.000	6.50	6.35	8.25
27	11.775	11.700	52.000	6.50	6.35	8.25
28	11.775	11.700	52.000	6.50	6.35	8.25
29	11.775	11.700	52.000	6.50	6.35	8.25
			AVERAGES FOR MONTH			
April	11.775	11.700	52.000	6.50	6.35	8.25
			AVERAGES FOR WEEK			
April						
5	11.775	11.700	52.000	6.50	6.35	8.25
12	11.775	11.700	52.000	6.50	6.35	8.25
19	11.775	11.700	52.000	6.50	6.35	8.25
26	11.775	11.700	52.000	6.50	6.35	8.25
			CALENDAR WEEK AVERAGES			
April						
1	11.775	11.700	52.000	6.50	6.35	8.25
8	11.775	11.700	52.000	6.50	6.35	8.25
15	11.775	11.700	52.000	6.50	6.35	8.25
22	11.775	11.700	52.000	6.50	6.35	8.25
29	11.775	11.700	52.000	6.50	6.35	8.25

Gold, Silver, Sterling

DAILY AND AVERAGE PRICES

1944	Sterling Exchange		Silver		Gold	
	"Checks"	"90-day	(c)			(d) United
April	(Nominal)	demand"	New York	London	London	States
1	401.000	(f)	(e)	(e)	(e)	$35.000
3	401.000	(f)	44.750	23.500	168s	35.000
4	401.000	(f)	44.750	23.500	168s	35.000
5	401.000	(f)	44.750	23.500	168s	35.000
6	401.000	(f)	44.750	23.500	168s	35.000
7	401.000	(f)	44.750	Holiday	Holiday	35.000
8	401.000	(f)	(e)	(e)	(e)	35.000
10	401.000	(f)	44.750	Holiday	Holiday	35.000
11	401.000	(f)	44.750	23.500	168s	35.000
12	401.000	(f)	44.750	23.500	168s	35.000
13	401.000	(f)	44.750	23.500	168s	35.000
14	401.000	(f)	44.750	23.500	168s	35.000
15	401.000	(f)	(e)	(e)	(e)	35.000
17	401.000	(f)	44.750	23.500	168s	35.000
18	401.000	(f)	44.750	23.500	168s	35.000
19	401.000	(f)	44.750	23.500	168s	35.000
20	401.000	(f)	44.750	23.500	168s	35.000
21	401.000	(f)	44.750	23.500	168s	35.000
22	401.000	(f)	(e)	(e)	(e)	35.000
24	401.000	(f)	44.750	23.500	168s	35.000
25	401.000	(f)	44.750	23.500	168s	35.000
26	401.000	(f)	44.750	23.500	168s	35.000
27	401.000	(f)	44.750	23.500	168s	35.000
28	401.000	(f)	44.750	23.500	168s	35.000
29	401.000	(f)	(e)	(e)	(e)	35.000
			AVERAGES FOR MONTH			
April	401.000	.....	44.750	23.500	....	35.000
			AVERAGES FOR WEEK			
April						
1	401.000	.....	44.750	.....	....	35.000
12	401.000	.....	44.750	.....	....	35.000
19	401.000	.....	44.750	.....	....	35.000
26	401.000	.....	44.750	.....	....	35.000

Calendar week averages, New York Silver: April 1st, 44.750; 8th 44.750; 15th, 44.750; 22nd, 44.750; 29th, 44.750.
(e) Not quoted (Saturday). (f) No quotation.

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis, as noted. All prices are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.225c. per pound, the average differential for freight and delivery charges.

(b) Export prices are net at refineries on the Atlantic seaboard and include sales of domestic copper in the foreign market. Owing to the World War and the disruption of normal trade relations, our export copper quotations, since September, 1939, have been based largely on f.a.s. transactions, ex United States ports. We deduct .05c. from the f.a.s. basis (lighterage, etc.) to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingot bars; cathodes are sold at a discount of 0.125c.

Quotations for zinc are for ordinary Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East and Middle West in nearly all instances command a premium of 1c. per pound over the current market for Prime Western but not less than 1c. over the *Engineering and Mining Journal's* average quotation for Prime Western for the previous month.

Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

(c) Silver other than newly-mined domestic, by Handy & Harman. Under Treasury order of July 6, 1939, the price on domestic newly-mined silver mined subsequent to July 1, 1939, was fixed at 71.11c. per troy ounce. Handy & Harman's quotations on newly-mined domestic silver, 999 fine was 70⅝c. throughout April.

(d) U. S. Treasury's gold price. Actual payment by the United States Treasury for gold in domestic and imported ore or concentrate is at 99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

tons of foreign origin lead monthly to supplement present available domestic production.

Zinc deliveries for March came to 84,558 tons, a new high record. This large total resulted from increased demands of the brass mills, galvanizers, and some anticipatory buying for April. Deliveries for April and May are likely to be smaller, according to trade opinion.

Quicksilver was dull and the price declined $5 per flask, effective April 20, in spite of curtailment in production. Inability to move finished products has been a factor. Production and consumption during February was almost in balance, according to the Bureau of Mines, amounting to 3,800 flasks and 3,700 flasks, respectively.

Call for platinum for military and essential civilian uses is so large, producers and distributors were told by WPB officials, that the metal will not be available during 1944 for the manufacture of jewelry. The Government has acquired stocks of platinum from sources not available through regular trade channels. Owing to the close balance between supply and demand, some of this reserve will be released this year.

Miscellaneous Metals Monthly Averages

Average prices of miscellaneous metals for March and April.

(a) New York, packed in cases, in lots of 5 tons or more but less than a carload. (b) Nominal. (c) Producer's price for commercial sticks. (d) Average producers' and platers' quotations. (e) Special shapes sold to platers.

	March	April
Quicksilver, N. Y. flask	130.000	128.200
Antimony (a)	15.839	15,839
Antimony, bulk, Laredo	14.500	14.500
Antimony, bulk, N. Y.	15.265	15.265
Antimony, Chinese (b)	16.500	16.500
Platinum, oz. troy	35.000	35.000
Cadmium (c)	90.000	90.000
Cadmium (d)	92.500	92.500
Cadmium (e)	95.000	95.000
Aluminum, ingot	15.000	15.000

E & M J Price Index

Weighted index of non-ferrous metal prices (copper, lead, zinc, tin, silver, nickel, and aluminum). The average for the years 1922-1923-1924 equals 100.

1929	110.33	1936	73.45
1930	82.87	1937	90.86
1931	60.20	1938	73.67
1932	48.26	1939	77.71
1933	59.79	1940	79.22
1934	69.59	1941	83.49
1935	74.66	1942	86.80
	1943	88.74	

	1942	1943	1944
January	85.39	88.74	88.74
February	85.90	88.74	88.74
March	85.90	88.74	88.74
April	85.90	88.74	88.74
May	85.90	88.74	....
June	85.90	88.74	....
July	85.90	88.74	....
August	85.90	88.74	....
September	88.74	88.74	....
October	88.74	88.74	....
November	88.74	88.74	....
December	88.74	88.74	....

Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipment, f.o.b. New York, unless otherwise stated

(May 1, 1944)

MISCELLANEOUS METALS

Aluminum, ingot, 99 plus per cent, lb	15c.
Antimony, domestic, spot, lb. 5 tons or more	15.839c.
Bismuth, ton lots, lb	$1.25
Cadmium, commercial sticks, lb	90c.
Calcium, lb., ton lots, 97 @ 98 per cent	$1.25
Chromium, 97 per cent grade, lb	89c.
Cobalt, 97 to 99 per cent, per lb	$1.50
Indium, troy oz	$7.50@$8.50
Nickel, electrolytic cathodes, lb	35c.
Magnesium, 99.8 per cent, carloads, lb	20½c.
Palladium, troy oz	$24.00
Platinum, (Official quotation) troy oz	$35.00
Quicksilver, flask of 76 lb., 100 flasks or more	$125.00
Selenium, 99.5 per cent, lb	$1.75
Silicon, minimum 97 per cent, spot, carloads, lb	14.75c.
Tellurium, lb	$1.75
Thallium, 100 lb. or more, lb	$10.00
Titanium, 96 to 98 per cent, lb	$5.00

METALLIC ORES

Beryllium Ore, 10 to 12% BeO. f.o.b. mines, ton	(b)$100.00@$120.00
Chrome Ore, per long ton, f.o.b. cars Atl. ports, dry, 48% Cr_2O_3, 2.8 to 1 ratio	$41.00
48% Cr_2O_3, 3 to 1 ratio	$43.50
Iron Ore, Lake Superior, Lower Lake ports, long ton:	
Old Range bessemer	$4.75
Mesabi bessemer	$4.60
Old Range non-bessemer	$4.60
Mesabi, non-bessemer	$4.45
Lead (Galena) 80 per cent, Joplin, Mo., ton	$76.01
Manganese (dutiable) f.o.b. cars Atl. ports, long ton unit Mn:	
50 per cent	79.8c.
48 per cent	78.8c.
46 per cent	76.8c.
Manganese Ore, domestic, 48%, f.o.b. MRC depot, l.t. unit	$1.00
Molybdenum Ore, 90%, per lb. of MoS_2 f.o.b. mines	45c.
Tungsten Ore, per unit of WO_3:	
Chinese, 65 per cent, duty paid	(b) $24.00
Domestic, 65 per cent and upward	(a) $26.00
Vanadium Ore, per lb. of contained V_2O_5 f.o.b. mines	27.50c.
Zinc Ore, Prime, 60 per cent concentrate, Joplin, Mo.; per ton	$55.28

(a) Prices at mines, small lots, usually several dollars less. (b) Nominal

METALLIC COMPOUNDS

Arsenious Oxide (arsenic) lb	4c.
Cobalt Oxide, 70 @ 71 per cent, lb	$1.84
Copper Sulphate, 100 lb	$5.00

ALLOYS

Beryllium Copper, 2.5 to 3 per cent Be, per lb. of contained Be	$15.00
Ferrochrome, 65 @ 70 per cent per pound of Cr contained	13c.
Ferromanganese, 78 @ 82 per cent, gross ton	$135.00
Ferromolybdenum 55 @ 65 per cent Mo. lb. of Mo. contained	95c.
Ferrosilicon, 50 per cent, per lb. of contained Si	6.65@8.10
Ferrotungsten, 75 @ 80 per cent, lb. of W contained	$1.90
Ferrovanadium, per lb. of V, delivered	$2.70@$2.90
Silicomanganese, 1 per cent C, gross ton	$133.00

NON-METALLIC MINERALS

Asbestos, f.o.b. Canadian (Quebec) mines (U. S. funds), ton:	
Crude No. 1	$650@$750
Crude No. 2	$165@$385
Spinning fibers	$124@$233
Paper stock	$44@$49.50
Shorts	$14.50@$26.50
Vermont, f.o.b. Hyde Park:	
Shingle stock	$62.50@$65.00
Paper stock	$44.00@$53.00
Shorts	$14.50@$28.50
Floats	$19.50
Barytes, long ton:	
Georgia, crude	$8.50@$9.00
Missouri, 93 per cent $BaSO_4$, less than 1 per cent iron	$6.75@$7.25
Bauxite, long ton:	
Domestic, crude, 50 @ 52 per cent (not dried)	$5.00
Domestic, chemical, 55 @ 58 per cent	$7.50@$8.50
Domestic, abrasive, 80 @ 84 per cent	$16.00
China Clay, f.o.b. mines, ton:	
South Carolina and Georgia, No. 1, bulk	$6.75@$8.00
Delaware, No. 1	$15.00
Feldspar, bulk, ton:	
Potash feldspar, 200 mesh	$17.00
Glass-spar, white, 20 mesh	$11.75
Fluorspar, f.o.b. mines, bulk, Kentucky and Illinois 85-5 per cent, all rail movement, ton	$33.00
Acid 98 and 1 per cent, bulk, ton	$37.00
Fuller's earth, f.o.b. Georgia or Florida, ton	$7.00@$14.00
Magnesite, per ton dead-burned, f.o.b. Washington	$22.00
Mica—Base prices on sheet, North Carolina one-half trim, as posted by the Colonial Mica Corp., the Government's buying agency for obtaining strategic mica, per pound, follow: Sheet to cut minimum of 1½ × 2 in. $2.40; 2 × 2 in. $3.52; 2 × 3 in. $4.64; 3 × 3 in. $5.12; 3 × 4 in. $6.08; 3 × 5 in. $7.04; 4 × 6 in. $8.00; 6 × 8 in. $9.12; punch, 30c. Premium and discounts up to 40 per cent, depending on quality and trim. Scale does not apply to non-strategic mica.	
Ocher, Georgia, ton	$19.00@$22.00
Pyrites, Spanish, per long ton unit of S, c i f. Atlantic ports	12c., nom.
Silica, in bags, 325 mesh, ton	$20.00@$40.00
Sulphur, Texas, mines, long ton	$16.00
Talc, f.o.b. works, ton:	
New York, double air-floated, 325 mesh	$12.00@$15.00
Vermont, extra white, 200 mesh	$9.50@$10.50
Tripoli, Missouri, ton:	
40 mesh, cream colored	$14.50
200 mesh, cream colored	$26.00

IRON AND STEEL

Pig Iron, Valley furnaces, gross ton: Basic	$23.50
Steel, base prices, Pittsburgh Billets, gross ton	$34.00
Structural shapes, 100 lb	$2.10

WASHINGTON REFLECTIONS

McGRAW-HILL WASHINGTON NEWS BUREAU

WPB Going Slowly In Making Cutbacks

General attitude in mineral branches of the War Production Board is to go slowly in the cutting back of mine and metal production. Even in the light-metal field, where production is far in excess of needs, no chances are being taken. This is partly because more than two years of the most intricate figure juggling has not produced any trustworthy system of estimating material needs. The fighting services have always been high in their estimates since the war started—sometimes fantastically so.

The plain fact is that we have no basis for gaging accurately the supply needs of the coming push at Germany's west wall. Nobody knows how gigantic a "shooting war" may develop in this phase of the conflict, and the relatively small adventures in which we have participated to date indicate that "shooting war" can consume materials at extremely rapid rates.

Also, the change in Selective Service policy to making a nearly clean sweep of the physically fit in younger age groups regardless of occupational or dependency complications promises to cripple mine and smelter output to an important but indeterminable extent. This gives WPB an additional reason for resisting pressure to close some mines and smelters where excesses are currently being produced.

Another factor is the known circumstance that metal mines are far behind in development work, because of labor shortages. If the invasion should proceed slowly, or the war be otherwise prolonged, it is not impossible that the pressure of scarcity which dominated the raw-material picture earlier in the war may be revived.

Preference Rating Order P-56 Revised

So far as the mining industry is concerned, a much more satisfactory method of securing maintenance, repairs, and operating supplies has been provided by the April 5 amendment of Preference Rating Order P-56. The new version of the order establishes a quarterly quota system based on the corresponding quarters of 1943 by which mines and smelters may secure their maintenance, repair, and operating supplies. It is expected that approximately 28,000 applications will be eliminated annually, a most welcome paperwork saving in the field and in Washington as well.

In detail, the order now provides that domestic producers holding serial numbers are assigned AA-1 ratings for the purchase of MRO supplies other than controlled materials. Controlled materials for maintenance, repair, and operating supplies may be secured by use of the allotment symbol "S-7." A limit of 120 percent of his "aggregate expenditures for maintenance and operating supplies during the corresponding quarter of 1943" is set for serialized producers. This includes rated items, controlled material, and unrated materials.

Foreign producers holding serial numbers—that is, producers outside of the United States and of Canada—may obtain priority assistance by filing the foreign mine quota application, Form WPB-2937.

Machinery and equipment may be obtained by domestic producers, foreign producers, and Canadian producers holding serial numbers by application for assistance on Form WPB-1319. However, no special application is necessary for minor capital additions which do not exceed the value of $500. Such minor additions are included within the producer's quota.

Producers not holding serial numbers are assigned a preference rating of AA-5 for MRC supplies including the minor capital additions. The allotment symbol S-7 is assigned to these non-serialized producers to secure controlled materials. The limit of 120 percent of his aggregate expenditures for controlled materials during the corresponding calendar quarter of 1943 is also in effect here. Gold mines covered by order L-208 are specifically excluded from the benefits of order P-56. Foreign producers will continue to use the foreign mine quota Form WPB-2937.

Clayton Plans Action On Surplus Disposal

The mineral industry was given a warning on April 28 of what to expect in the way of disposal of unused metal stocks if no provision is made for them in the form of stockpile legislation. W. L. Clayton, Surplus War Property Administrator, announced on that date a program of "aggressive action" designed to expedite the movement back into production of property left in the hands of producers by cancellation of war contracts. Mr. Clayton is reported to be aware of the special problems of metal producers in this matter of surplus disposal, but, even so, it would be far better to have definite provision made for handling surplus metals than to allow them to be treated as a part of Mr. Clayton's announced plan, however aggressive it may be.

With regard to raw materials in excess of amounts involving $10,000, he says: "Crude or simple raw materials are to be sold at the going-market price, if in commercial lots, where there is a clearly established and readily ascertainable market price. If a sale at the going-market price cannot be made, the property will then be turned over to a disposal agency for sale."

That last sentence has an ominous sound, despite the knowledge of Mr. Clayton's good intentions, for hanging definitely in the air just behind the words "for sale" is the inference, "at the best price it can get."

Outlook Is Poor For Mining Deferments

Induction of young men into the Army and resulting loss of operating personnel by the mines has been accepted as inevitable in Washington and in the field. The question that remains concerns the amount of production that will be lost as a consequence. As yet there is no official answer, although there is much speculation.

Unofficial estimates of possible production losses vary from the optimistic view of less than 5 percent to the very pessimistic view of as much as 30 percent. That there will be some loss in production due to a shortage of manpower there can be no doubt, but as only about 15 percent of mine labor is within the vulnerable age bracket from 18 to 26, and because past experience shows that only about 60 to 65 percent of these men will pass the physical examinations, loss of production based on straight manpower loss might be estimated at something less than 10 percent.

But any reckoning of production losses is little more than guessing at this time. It is known that the losses will vary from one metal to another, from one area to another, and from one mine to another.

Seemingly, the Army wants young men more than it wants production of basic raw materials. When the War Manpower Inter-Agency Committee on Occupational Deferments made public its list of critical activities and programs to assist in the handling of claims for deferments of registrants under 26, mining and smelting were not included. Behind the scenes, the possibility has been discussed that the Army is relying upon industry to save the situation by performing a miracle. Certainly the ingenuity of management can be depended upon to overcome some of the manpower losses.

Government officials are afraid that the mining industry does not realize that an occupational deferment is merely a temporary respite to permit an employer to find and train a replacement. In order that the industry may know the necessary procedure to hold key men of draft age long enough for the replacements to be thoroughly schooled, many of the metal divisions of the War Production Board have sent detailed instructions to mine operators.

It is also important that mine operators keep their files on deferred employees up to date. This is particularly necessary when the men have had their cases transferred to draft boards outside of the State in which they originally registered.

International Monetary Cooperation

Proposals for international monetary cooperation were announced in Washington late last month by Secretary Morgenthau, who made public a statement of principles drafted by technical experts of the United and Associated Nations. The crux of the proposal is the establishment of an international monetary fund to which the nations would subscribe in gold and their own currencies. Subscriptions would be based on a formula that takes into consideration the proportion of a country's trade to world trade, its gold holdings, and its gold production. The purposes of the fund would be to stabilize foreign exchange, avoid competitive depreciation of national currencies, and facilitate international trade.

Of special interest to the mining industry is the rôle of gold in the establishment and operation of the fund. It is proposed that "the obligatory gold subscription of a member country shall be fixed at 25 percent of its subscription (quota) or 10 percent of its holdings of gold or gold convertible exchange, whichever is the smaller."

Governments are not yet asked to approve this statement of principles. It will be the subject of discussion at a formal international conference to be held later this year, which will draft definite proposals to be submitted to the governments of the United and Associated Nations. Political discussion will then determine the fate of international monetary cooperation for stabilization of exchange and promotion of world trade.

Canadian Aluminum Shipments Deferred

On April 21 Philip D. Wilson, director of the Aluminum-Magnesium Division of WPB, confirmed the announcement made earlier by N. A. Zomrick, president of the Aluminum Workers of America, CIO, that delivery of 100 million pounds of aluminum from Canada would be deferred until 1945. Mr. Wilson stated that 531 million pounds of the total contracted for with the Aluminum Company of Canada remained undelivered, and that the original estimate presumed 311 million pounds would be delivered in 1944 and 220 million pounds in 1945.

This deferment of deliveries was made in response to pressure from the aluminum workers' union and from Pacific Northwest interests as a means of reducing the threat of unemployment in the aluminum industry and of preventing the shutdown of plants in the Pacific Northwest. However, Mr. Wilson did not say that the government is planning to cancel the Canadian contract. Therefore, any action yet announced defers but does not remove the threat to the domestic industry. Also, cutbacks in domestic production are still going on, as production is in excess of requirements. Announcement was made on May 1 that two production lines in the Borough of Queens, New York City, would be shut down.

Stockpile Legislation Still Bogged Down

The belief expressed in these columns last month that dissident viewpoints over stockpile legislation would be compromised by amending the Scrugham bill does not seem to be approaching fulfillment. Instead, the departments seem to be insistent on submitting a rival bill, thus dividing the much-needed strength of forces behind mineral stockpile legislation. The situation is as stated by Julian D. Conover, secretary of the American Mining Congress, in addressing the American Zinc Institute recently in St. Louis: "Meanwhile, several of the government departments, which are understood to include War, Navy, State, Interior, and the Foreign Economic Administration, have been working on stockpile legislation, but their proposed bills have not been made public. . . . It is understood that differences of viewpoint have existed between the departments over certain features, and that various drafts have been submitted to the Office of War Mobilization for review."

Departmental representatives seem to be confident that the Scrugham bill can be successfully sidetracked. In our opinion, this remains to be seen. From the industry viewpoint, two major issues are involved. The Scrugham bill calls for stockpiles adequite for three years of total war, provides for domination of the program by men from the mining industry, and would offer some cushion for the marginal producer who will probably otherwise find himself out of business at the end of the war, if not before. Any compromise of the departmental viewpoints would probably make the amounts to be stockpiled discretionary, probably would not cushion the marginal producer, and would probably place administration essentially in departmental hands, with the industry subrogated to a purely advisory status.

We reiterate our suggestions that members of the industry would be wise to express their views to Congress on this subject, both to assure passage of any such legislation, and to avoid having the industry reduced to the position of an onlooker as far as administration is concerned.

Old War Claims Will Finally Be Settled

Final settlement of war minerals claims from the first World War has been authorized by a Congressional act just signed by the President. The bill appropriated the sum of $54,775.82 to "enable the Secretary of the Interior to complete payment of awards" under the war minerals relief statutes. It has taken 25 years to wind up the claims of the first World War, which has been accomplished barely in time to make way for the difficulties which will arise following the close of hostilities of the current World War. Considering the urgent need for providing full employment after this war, and the much greater dislocation of industry, it will be tragic if some means is not devised for quick settlement.

Latest Scarcity List Contains Few Metals

The latest Conservation and Supply List of the Conservation Division of WPB makes it appear that we have little to worry about in non-ferrous metals with which to carry on the war. Comparatively few items are listed among the commodities that are "insufficient for war plus essential industrial demands." Those items embrace cadmium, tin, nickel, and columbium. Even in this restricted list two metals appear that trade authorities do not view with alarm. In fact, one of these, cadmium, is held to be scarce only because WPB has put a substantial poundage aside for some reason not well known in the market place.

With reference to nickel, the head of International Nickel Company of Canada has informed stockholders that sufficient nickel was refined in 1943 to meet requirements of the United Nations.

Except for some uncertainty about the political situation in Bolivia, which has become clouded in censorship, supplies of tin concentrates are nothing to get worried about. Our tin smelter has been doing better, operating largely on Bolivian concentrates, some of which are difficult to handle, and the over-all supply situation in tin has not deteriorated since the first of the year. However, care in allocating tin is expected to continue for some time to come. The Texas smelter is producing about 2,500 tons per month. Stocks of tin concentrate in this country are sizable, and imports of both metal and concentrate from Africa have helped materially.

Though Washington officials are conducting themselves as if domestic production of copper, lead, and zinc will fall away over the remainder of the year, all three metals are grouped among those at present in sufficient supply for essential needs.

Beginning of Defense Plant Disposal

Three detinning plants and government-owned buildings and equipment of a graphite mine are unofficially announced to be for sale by the Defense Plant Corporation. These are the first such establishments to be offered for sale. Most of the Defense Plant Corporation's facilities not in use are being held in standby condition in case of emergency. A few are becoming available for public purchase from time to time when information in detail will be made available to the public.

Disposal activities are proceeding slowly. Officials are anxious that no blunders be made which will cause embarrassment to the program. Only by cautious negotiation do they expect to establish precedents which may be followed as other manufacturing facilities become available for sale.

Government officials are faced with a necessity for haste in setting up the machinery for Surplus War Property Administration because of the size of the undertaking and the necessity of slowly and carefully establishing the procedure for later action.

NEWS OF THE INDUSTRY

Zinc Institute Finds Outlook Is Mixed

A record attendance of 259 persons at the annual meeting of the American Zinc Institute, held in St. Louis on April 17 and 18, heard speakers portray a mixed outlook; bright from the viewpoint of future markets for zinc, but dimmed by warnings that postwar foreign competition is likely to obtain a larger slice of domestic concentrate and metal markets than ever before. The prospect of serious handicaps from manpower shortages was lightened somewhat by the announcement that "B" and "C" premium mines would not be disturbed until the effects of the draft became evident.

K. J. T. Ekblaw, promotion manager for the Institute, forecast an agricultural building market of from 20 to 40 billion dollars, of which galvanized products can expect a good share.

M. L. Trilsch, of WPB, forecast a new supply of 1,066,000 tons of slab zinc in 1944, and said that stocks would climb to 302,000 tons by the year's end. Both of these predictions might be upset by manpower difficulties, however.

Discussing the postwar outlook for heavy metals, J. D. Sullivan, of Battelle Institute, prophesied a good market for zinc coatings and said zinc would hold its own in the die-casting field. He anticipated larger postwar than prewar markets for all the metals.

Reviewing the stockpile issue, Julian D. Conover, secretary of the American Mining Congress, said that shortages must never be risked again in any future emergency and called for a national metal stockpile as a permanent military reserve. He reported that a departmentally sponsored substitute for the Scrugham bill was being considered.

T. H. Miller, of the U. S. Bureau of Mines, forecast a postwar market for slab zinc of 550,000 to 750,000 tons per year, plus 100,000 tons for zinc in pigments. About 50,000 tons may be available from secondary sources. He predicted that domestic mine production would be insufficient to meet these needs and that our dependence on imports would thus increase. Not less than 400,000 tons per year should be available to the United States from foreign sources.

In discussion, E. H. Snyder, of Combined Metals Reduction Co., contradicted this view, saying that the United States is able to maintain self-sufficiency in zinc, given an adequate price. When asked what metal price he considered adequate, Snyder replied that 7c. to 9c. per pound would be sufficient, even at present wage scales.

Regional developments and outlook were discussed for the West by R. S. Caples, of Anaconda Copper Mining Co.; for the East, by R. B. Paul, of New Jersey Zinc Co.; and for the Central States by F. F. Netzeband, of the Tri-State Ore Producers Association, and Evan Just, of *Engineering and Mining Journal*. Apart from manpower shortages, the East was expected to hold its own, the West also, at going prices and premiums, but the Tri-State and the Platteville districts were portrayed as requiring constantly increasing stimulation to maintain production.

James Douglas, director of WPB's zinc division, summarized the performance of zinc mines receiving quotas for the last quarter of 1943. A total of 193,004 tons was produced at an average price of 10.74c. Of this, "A" quotas produced 63.7 percent at an average cost of 9⅞c.; "B" quotas, 15.4 percent at an average of 13c.; and "C" quotas produced 20.9 percent at an average cost of 15.64c. The Eastern region produced 24 percent at an average price of 8.87c.; the West, 43 percent at an average price of 10.55c.; and the Tri-State, 33 percent at an average price of 13.08c. Apart from manpower shortages, Douglas predicted a 1944 production of 742,000

Photos from Copper Commando

LABOR-MANAGEMENT COMMITTEE ACTIVITIES of Anaconda Copper Mining Co. figured prominently in the War Production Drive exhibit held recently in Washington to demonstrate the effectiveness of labor-management committees in industry in general. The upper photo shows the ACM exhibit; the lower, some of those responsible for designing and building it. Left to right are: Oscar Baarson, of the WPB; Frank A. Linforth, assistant to the manager of mines of the ACM in Butte; Charles Gardner, of the Butte Miners' Union (CIO); Marg Sammons, co-editor of the *Copper Commando*, ACM labor-management committee paper; William J. McMahon, ACM labor commissioner in Butte; and John Bird, of the AFL

tons from domestic mines, but said that the loss of physically acceptable men aged 18 to 30 would cut production by 144,400 tons. Therefore, he stated, quotas will not be generally reduced until the effects of the draft are realized.

H. A. Gray, of Eagle-Picher Mining & Smelting Co. and chairman of the Zinc Institute Traffic Committee, described an outstanding record of accomplishment of his group. He pleaded for quick loading and unloading of cars and for capacity loadings.

R. A. Young, of American Zinc Co., pointed out that reconstruction and pent-up demand would probably afford domestic smelters a good short-term postwar market, but that rebuilding of European smelters and self-sufficiency policies on the part of concentrate-producing countries would make the long-term domestic outlook dismal unless the United States adopts a policy of protecting domestic zinc smelting.

Discussing the postwar outlook for zinc alloy die castings, S. E. Maxon, of New Jersey Zinc Co., predicted their widening use and the continued use of zinc for this purpose. In a comparison of metals suitable for die casting, Mr. Maxon showed that brass excels in mechanical properties; magnesium, in lightness; aluminum, in heat and electrical conductivity; but zinc is lowest in cost and is easiest to handle.

N. E. Cook, of Wheeling Steel Corp., showed that the sheet galvanizing industry had nearly been erased during the war. He stated that pent-up demands would double postwar markets, and expressed confidence in the ability of galvanized products to hold their own against competition.

WPB Cuts Production At Basic Magnesium

It was reliably reported late in April that four of the ten production units at Basic Magnesium, Inc., Las Vegas, Nev., were in process of being shut down in compliance with an order of the WPB. Stoppage of production in the four units will not be complete until the middle of June, however, because of the necessity of a gradual shutdown of the chlorinators and electrolytic cells.

Prior to this curtailment, the plant, under the direction of Anaconda Copper Mining Co., had been producing magnesium metal at a rate of 10,000,000 lb. per month. Following the shutdown, the output will probably be 6,000,000 lb. monthly. Operating costs have been steadily reduced of late and are said to be competitive at present.

Reason for the production cut at BMI is said to be a need for more of Boulder Dam's power in Los Angeles and a congestion of transportation facilities in the Las Vegas area. In addition, reserves of magnesium metal are regarded as ample at present and it is felt that the manpower released by the BMI cut (estimated at 1,500 men) would be more useful elsewhere.

Disagreement with this point of view was expressed by Senator McCarren, of Nevada, who protested against the order and stated that it would be more expensive to shut down the units than to store the metal produced by them. It has also been pointed out that a prolonged shutdown will make it extremely difficult ever to resume operations in these units, because the moisture that will be absorbed by the refractory materials must be somehow removed before operation could be resumed.

Gold Sales Increase In Chilean Auctions

Auctioning of gold as a counter-inflationary measure in Santiago, Chile, continues, and interest in the sales appears to be increasing. In March, $579,000 was paid for 12,246 oz., an average price of $47.20 per ounce. This is an increase of nearly three times in amount over the gold sales in February, and the average price held the same.

The auctions, which were described in the February, 1944, issue of *E. & M. J.*, p. 116, and in the April, 1944, issue, p. 104, are being held in order to retire as much as possible of the paper currency of Chile, in which a mild inflation exists at present. The gold being sold at auction includes about 4,000 oz. per month, produced as bar gold locally, about 10,000 oz. per month returned from the U. S. after having been recovered there in smelting Chilean copper, and shipments from the U. S. of about $2,500,000 in gold exported from Chile since April, 1943.

The figures for gold sales reported in the April, 1944, *E.&M.J.* were in error in that they gave only the gold sold for the account of the Caja de Credito Minero. The correct figures for the auctions thus far are as follows:

	Gold Sold, Ounces	Price Paid, $	Average $/Ounce
January	3,000.8	152,800	50.91
February	4,308.0	203,700	47.28
March	12,246.0	579,000	47.28
Total	19,554.8	935,500	47.83

A.S.&R.'s Zinc Output Increased During 1943

Production of the refineries of American Smelting & Refining Co. and subsidiaries during 1943, with comparable figures for 1942, as revealed in the annual report to stockholders, follows:

	1942	1943
Gold, oz.....	1,847,333	1,337,928
Silver, oz.	79,157,139	67,643,787
Lead, tons	527,870	478,921
Copper, tons ..	608,809	547,015
Zinc, tons.....	119,848	123,672

Owing to war demands elsewhere, the WPB felt it necessary during 1943 to restrict the amount of material that could be used in the improvement of the company's plant, the report states. As a consequence, considerable deferred maintenance and improvement remains to be undertaken when the necessary materials become available after the war is over.

In reference to the acquisition of a 50 percent interest in the Goiaz nickel deposits in Brazil, the company states that the pilot plant to treat this ore at Perth Amboy, N. J., has been completed and is operating satisfactorily. Owing to lack of necessary machinery, construction of a road to the property in Brazil has been delayed, and completion of this road is a necessary preliminary to actual plant construction at the mine. The road is to be built by the Brazilian government.

Coal Shortage Looms Miners Are Warned

In an open letter to industrial users of bituminous coal, Chairman Nelson of the WPB warns against an impending fuel shortage in 1944. He urges heavy summer buying to build up stockpiles.

The position this year, he says, is much more serious than last, and if manpower shortages in the coal mines are increased by the draft, the coal deficit may reach 45,000,000 tons. Summer buying will keep coal mines working at capacity and will prevent the normal summer production decline. This is important because coal production lost this summer cannot be made up next winter, when the shortage will make itself felt.

Metal mines using coal for fuel are therefore warned that it is wise to stock this summer's coal supply to the maximum permitted under the regulations governing such purchases.

E. & M. J. Subscribers Please Note

Is your subscription to *Engineering and Mining Journal* about to expire? Do you want to insure uninterrupted receipt of the *Journal*? If so, please do not fail to renew your subscription before expiration. The number of copies of *E. & M. J.* that may be printed is limited by WPB orders curtailing the use of paper. At present it is impossible to fill promptly all new subscriptions, and there is a waiting list of substantial proportions that can be accommodated only as fast as present subscriptions expire. If you want to insure the continuity of your subscription and avoid the embarrassment of joining the waiting list, please pay attention to the publisher's notices, and renew before expiration.

NEW BOOKS

AMERICAN MINING LAW. By A. H. Ricketts. Bull. No. 123, Division of Mines, State of California, Ferry Building, San Francisco. Pp. 1018.

Congratulations are in order to the great mining State of California for the publication of this fourth edition of Ricketts' classic treatise on American mining law. Enlarged and revised to the date of publication, February, 1943, the volume has a timely interest that has been aroused and intensified by recent proposals to change the mineral land policy of the United States.

The author was a member of the San Francisco bar, whose deep interest in the subject dates back fifty years, and whose early writings were published in reports of California's State Mineralogist. In 1911 Mr. Ricketts published privately his first manual of American mining law. The current revision was completed just prior to his death in 1938, and has been brought up to date by his associate, William H. Metson.

An elaborate table of contents arranged by topics and an extensive index of nearly 200 pages make the volume exceptionally useful for reference. It will be well received by the mining industry and all who have related interests.

THE MONETARY STANDARD INQUIRY. A series of pamphlets available free in single copies, additional copies, 10c. The Monetary Standards Inquiry, 408 Graybar Building, New York 17, N. Y.

No. 8. "The Postwar Role of Gold," by Chas. O. Hardy. Pp. 26: A detailed discussion of the operation of the gold standard and the role of gold under (a) the gold standard, (b) managed paper currencies, and (c) international stabilization plans. The author says that gold is superfluous without a gold standard and that silver is the same unless bi-metallism or silver standards are adopted. Recommended for reading by precious-metal producers as a well-presented view more or less contrary to their own.

No. 9. "Inter-War Currency Lessons," by John Parke Young. Pp. 21: After comparing inflation in both world wars and showing the similarity between 1918 and the present time, the author points out that our currency thinking is now trending in the same direction as before, toward the restoration of gold and prewar parities. He discusses the problem of postwar currency management and makes several recommendations toward their solution.

No. 10. "Money and International Trade," by John B. Condliffe, Pp. 18: This discussion presents the case for managed currency. A "money of account" is proposed, with free transactions and stable rates. The author claims that the times are out of joint with a gold standard and that new sources of credit should be provided. He emphasizes that the United States must take payment in goods and promote international trade and prosperity.

PIPELINE TO BATTLE. By Major Peter W. Rainier. Random House, 20 East 57th St. New York City. Illustrated by maps 8½ by 9¾ inches; pp. 302. Price $2.50.

Major Rainier, mining and civil engineer, adventurer, soldier, and writer of distinction ("Green Fire," "American Hazard," "My Vanished Africa"), was born in Swaziland. He fought in German North-East Africa in the first World War, came to the United States in 1919, and later acquired mining interests in Bogota, Colombia. When his doctor ordered him to sea level to "live soft," he went to Egypt, where, on the invasion of North Africa by German and Italian armies, he found himself, over 50, "the oldest subaltern in the Army of the Nile." Quickly he rose to the rank of lieutenant of Royal Engineers, and to captain and major of the General Staff. To the troops he was "The Water Bloke"; and by disobeying orders and slashing red tape he wrought the impossible for three hard years, with his pipelines from El Alamein to Tunisia.

The major wrote "Pipeline" under fire. He was on every mile of the three-year struggle that destroyed the Axis hordes. That he stood the gaff was as remarkable as the miracle of keeping the British and their allies supplied with that without which success would have been unthinkable. With the maps which he supplies, readers not familiar with military techniques can visualize the strategy of Wavell, Montgomery, and Eisenhower.

So far as Africa is concerned, this is the book of the war.

CALCULUS REFRESHER. By A. A. Klaf. Whittlesey House, McGraw-Hill Book Co., New York and London. Pp. 431. Price $4.

A book for technical men whose war work requires a quick and practical review of differential and integral calculus. The method of presentation is novel, comprising a series of questions and answers dealing with basic concepts and essentials. Illustrative examples are generously used, and each chapter includes some problems to test the student's understanding.

MINERALS YEARBOOK. 1941. Economics and Statistics Service, U. S. Bureau of Mines. Pp. 1573. For sale by the Superintendent of Public Documents, Washington, D. C. Price $2.25.

This is the first volume of the Bureau of Mines Yearbook to be released to the public since the war began. Censorship on mineral statistics has gradually been relaxed, and some current information not of a confidential character is now being released that will appear later in book form. The 1941 volume contains the customary summaries by products and states, showing domestic production, imports, consumption, stocks, prices, uses, and world trade. Emphasis is placed on the war minerals program and on the government agencies engaged in acquiring needed minerals at home and abroad.

HOW TO MAINTAIN ELECTRIC EQUIPMENT IN INDUSTRY. General Electric Co., Schenectady, N. Y. Pp. 372. Price $1.75.

Practical tips on keeping all kinds of electric equipment in top-notch condition, including preventive-maintenance schedules and trouble-shooting charts, are given. The book also deals with battery trucks, cable and wire, diesel-electric locomotives, electric furnaces, instruments, insulation, lightning arresters, mine locomotives, motors and generators, rectifiers, switch gear, transformers, turbines, and welders. A section is devoted to technical data, including treatment for electric shock.

SLIDE RULE SIMPLIFIED. By Charles O. Harris. Published by American Technical Society, Drexel Ave. at 58th St., Chicago, Ill. Pp. 258. Price $3.50, with a slide rule; $2.50 without rule.

Many individuals could make greater use of the slide rule to their own advantage and probably would do so if they merely understood its manipulation better. The underlying theory is not essential. Mr. Harris explains every step in the use of the rule and its various scales in a leisurely manner, with illustrations as aids and numerous problems for demonstration and practice. A novelty is the accompanying 10-in. Mannheim rule, of cheaper construction but more than good enough for purposes of self-instruction.

INTERNATIONAL CURRENCY—GOLD VERSUS BANCOR OR UNITAS. Dr. Benjamin M. Anderson. Economists National Committee on Monetary Policy, 70 Fifth Ave., New York. Pp. 16. Free.

A highly competent, pungent, and realistic discussion of postwar international finance, exposing the weaknesses of the Keynes and White plans for international currency stabilization and urging a return to the gold standard.

(*Continued on page 136*)

PERSONAL NEWS

Charles Will Wright has been made chief foreign mineral specialist for the U. S. Bureau of Mines.

A. W. Frolli, mining engineer, is now with Metals Reserve Co. at Washington, D. C.

H. L. Pierce, of the iron-ore department of the M. A. Hanna Co., Cleveland, Ohio, has been made executive vice-president of the company's iron-mining subsidiaries and is in charge of operations and sales.

George A. Packard, mining engineer of Boston, Mass., has recently completed two months' work examining mining properties in Mexico. He planned to return to the United States in the middle of May.

M. S. Fotheringham, who has been general superintendent of operations for Steep Rock Iron Mines, Ltd., at Atikokan, Ontario, is now resident manager.

Bernard Manderfield, general mine superintendent for Copper Range Co. at Painesdale, Mich., has resigned. He has been succeeded by **Lynn Hersey,** recently of the Copper Section of WPB.

Philip Kraft has become a member of the board of directors of the Magma Copper Co.

M. E. Love has succeeded **Arthur Kendall** as manager of Resurrection Mining Co., Leadville, Colo.

John C. Kinnear, Jr., has been made assistant smelter superintendent of Chino mines division of Kennecott Copper Corp. at Hurley, N. M.

HOWARD T. JAMES

Howard T. James, managing director of Pioneer Gold Mines of B. C., Ltd., has returned to Vancouver after an extended trip to eastern Canada, the United States, and British Guiana, during the course of which he made examinations of properties. Dr. James is president of the Mining Association of British Columbia and chairman of the Mining Bureau of the Vancouver Board of Trade.

Edward Pesout has been advanced from the position of assistant superintendent of the Nevada division of Kennecott Copper, at McGill, Nev., to that of smelter superintendent. **Harry O'Carroll,** former general foreman, succeeds Mr. Pesout.

V. J. Lannigan has joined the mining engineering department of the Oliver Iron Mining Co., on the Vermilion Range. He recently resigned from the staff of the International Nickel Co. at Sudbury, Ontario, with which he had been associated for 16 years. His new location with the Oliver company will be at Ely, Minn.

Robert William Wilson, mining engineer, Buffalo, N. Y., has sailed from New York to accept a position as mine superintendent for the Saudi Arabian Mining Syndicate, Ltd., at its mine near Jedda, and is expected to leave for that post at an early date.

Ned E. Nelson, formerly consulting engineer of the Granby Consolidated Mining, Smelting & Power Co., Ltd., has accepted a position with the exploration department of Wright-Hargreaves Mines, Ltd., at Kirkland Lake, Ontario.

Chamberlain B. Hume, superintendent of Kelowna Exploration Co., Ltd., left the Nickel Plate mine, at Hedley, at the end of April to accept a position in South America.

F. C. Torkelson, mill designer and builder, formerly associated with Utah Copper Co., U. S. Smelting & Refining Co., and other corporations, has established the F. C. Torkelson Co., Pacific National Life Building, Salt Lake City.

Howard I. Young, president of the American Zinc, Lead & Smelting Co., was reelected president of the American Zinc Institute on April 18 for the tenth consecutive year. **C. Merrill Chapin,** vice president of St. Joseph Lead Co., and **John A. Robinson,** vice president of the Eagle-Picher Mining & Smelting Co., were reelected vice presidents. **R. B. Caples,** of Anaconda Copper Mining Co., was elected a vice president to succeed **James O. Elton,** retired. **Raymond Orr,** of the Athletic Mining & Smelting Co., was named treasurer, and **Ernest V. Gent,** secretary.

Jack M. Ehrhorn, mining engineer and until recently construction superintendent for Western-Knapp Engineering Co., of San Francisco, Calif., is now a member of the Salt Lake City staff of U. S. Smelting Refining & Mining Co.

A. G. Mackenzie, manager of Utah Metal Mine Operators' Association and widely known throughout the metal-mining industry, has been appointed industrial member of a new state selective service appeal board.

ROBERT S. ARCHER

Robert S. Archer has joined Climax Molybdenum as metallurgical assistant to the vice president. He is a graduate of the University of Michigan. During the first World War he served in the metallurgical laboratory of the Bureau of Aircraft Production at Detroit, Mich. In 1919 he joined the staff of Aluminum Company of America, in Cleveland. In 1930 he became director of metallurgy for the A. O. Smith Corp., of Milwaukee, Wis., and in 1934 he was appointed chief metallurgist for the Chicago district of Republic Steel, a post which he held until assuming his present position.

Andrew Meyer, formerly development engineer of Cleveland Rock Drill Co., has joined The International Wean Engineering Co., of Warren, Ohio, as engineering consultant. Mr. Meyer has a background of mining experience in the Soviet Union, Canada, and South America, and on various occasions has written articles for *Engineering and Mining Journal.*

Marvin E. Johnson, of Coleraine, Minn., has been made assistant superintendent of the Oliver Iron Mining Co.'s Gross-Marble and Arcturus mines, in the Canisteo district of the Mesabi Range. He has been on the mining engineering staff of the Oliver company since 1937, and assumed his new duties on April 1.

Lieut. Col. Tenney C. DeSollar has retired from the service and is now with the Metals Reserve Co. in Washington.

Cyrus S. Eaton, of Cleveland, chairman, and **Maj. Gen. D. M. Hogarth,** of Toronto, president of the Steep Rock Iron Mines, Ltd., were visitors in Duluth, and on the Mesabi and Vermilion ranges, recently.

Earl K. Nixon has been made manager of Western exploration of Freeport Sulphur Co. to succeed **David St. Clair,** who was transferred to the company's headquarters in New York. Since 1937 Mr. Nixon has been director of the department of geology and mineral industries for the

Dr. R. R. Sayers, Director of the U. S. Bureau of Mines, presents a bag full of silver dollars to Francis M. Shore, assistant chief of the Economics and Statistics Service of the Bureau, on the occasion of Mr. Shore's retirement on Feb. 29 last, after completing more than 42 years of service with the federal government. Left to right: Dr. Sayers, Mr. Shore, Mrs. Shore, and E. W. Pehrson, chief of the Economics and Statistics Service. Photo by courtesy of the Bureau.

State of Oregon, and during the present war period he has been technical consultant to the War Production Board and Metals Reserve Co. For many years he was engaged in mineral exploration for the M. A. Hanna Co., of Cleveland, Ohio. Mr. Nixon is president of the Association of American State Geologists.

John L. Johnson, Jr., has become safety engineer for Demerara Bauxite Co., Ltd., at Mackenzie, British Guiana.

Robert S. Moehlman has been elected chairman of the Nevada section of the A.I.M.E. for the ensuing year.

John E. Bowenkamp, mine exploration engineer for Wellington Investments Ltd., of Medellin, Colombia, South America, has recently been permanently transferred by his principals to Peru, where he will carry on mine scouting and exploration work. Mr. Bowenkamp may be addressed for the present at the Gran Hotel Bolivar, Lima, Peru, South America.

W. H. Lawrence was recently elected president of the Transvaal Chamber of Mines for 1944.

Jay A. Carpenter, director of the Mackay School of Mines at the University of Nevada and head of the Nevada Bureau of Mines, at Reno, Nev., was the principal speaker at the April meeting of the Mining Association of the Southwest held in Los Angeles, his subject being "Western Cooperation in Current Problems of the Mining Industry."

P. R. Bradley, Jr., president, Pacific Mining Co.; **W. W. Mein, Jr.,** vice president, Calaveras Cement Co.; **F. C. Van Deinse,** vice president and general manager, Yuba Consolidated Gold Fields; **W. C. Browning,** general manager, Golden Queen Mining Co.; and **George W. Hallock,** president and general manager, Sixteen-to-One Extension Mining Co., are the five new members of the State Mining Board appointed recently by Governor Earl Warren of California.

Hadley S. "Pete" Fowler has been transferred from Trail to the Vancouver office of Consolidated Mining & Smelting Co. of Canada, Ltd.

J. C. Honsberger, mining engineer and geologist, who, for the past two years has been general superintendent of the operations of Siscoe Gold Mines at Siscoe, Quebec, resigned his position as of March 15 and has opened a consulting office at Val d'Or, Quebec.

E. J. Franklin, chief mechanical engineer for Utah Copper Co., and consulting power-plant engineer for Kennecott Copper Corporation operations, has retired after 35 years' service and now resides at Encino, Calif. He has been connected with Utah Copper company operations since D. C. Jackling constructed the original Magna steam plant to furnish electric power for the Bingham open-cut mine and the Magna concentrator. He has made various contributions in connection with the application of the air lift to the unwatering of mines and the handling of pulp in ore concentrators.

In the article "Neglected Copper-Zinc Belt Revived Under War Demand," published in *E.&M.J.* in March, 1944, the captions of the pictures of the Newton mine and the Penn mine, in California, on pages 62 and 63 respectively, were accidentally interchanged.

H. K. Masters, chief of the tungsten, molybdenum, vanadium, cobalt, antimony and beryllium branch of the War Production Board, has resigned from that post. **Miles K. Smith,** of the Latrobe Electric Steel Co., has been named to succeed Mr. Masters.

Gustave L. Neumann, mining engineer of Denver, Colo., who has had long and varied mining and engineering experience in Colorado and the Southwest, has accepted a position with the Bureau of Mines, and has been assigned to Eastern Regional Headquarters at College Park, Md.

Jacob A. Stampe, mining engineer, who has been with the Mineral Production Security Division of the Bureau of Mines, has been transferred to District 2 of the Eastern Region, where he will supervise projects and do field examination work under **G. D. Jermain,** district engineer for the Bureau of Mines at State College, Pa.

Elmer Hetzer has been elected president of the Boulder County, Colorado, metal Mining Association, succeeding **Ray Sullivan,** operator of the Boulder tungsten mill at Nederland. **Harry Williamson** was elected vice president; **John Foote,** treasurer; and **George Jump** continues as secretary. The board of directors includes **Mr. Hetzer, Harry Williamson, John Foote, W. J. Trepp, George Teal, T. K. Scott, Ray Sullivan, John Wolff,** and **Ernest Wahlstrom.**

L. E. Dick has resigned his post as assistant superintendent of Montreal Mining Co. at Montreal, Wis., and is now associated with Vermont Copper Co., South Strafford, Vt.

Ernest F. Lang is in charge of a major dragline-dredging operation on Spanish Creek, Quesnel mining division, British Columbia, undertaken by St. Eugene Mining Corp., subsidiary of Ventures, Ltd.

Harry Hey, technical superintendent of Electrolytic Zinc Co. of Australia, Ltd., was recently elected president of the Australasian Institute of Mining and Metallurgy for 1944.

Russell Mervyn Murray, general manager of Mt. Lyell Mining & Railway Co., Ltd. Queenstown, Tasmania, was recently awarded the medal of the Australasian Institute of Mining and Metallurgy for 1943 "in recognition of his outstanding services in the development of mining and metallurgical practices at Mt. Lyell, Tasmania."

J. T. Eddy, former general manager of Tindals Gold Mines, Ltd., Coolgardie, Western Australia, and until recently engaged in wolfram production in Northern Territory, has assumed the post of manager of Mt. Bischoff Tin Mining Co., Waratah, Tasmania.

Dr. W. H. Emmons and **Dr. C. R. Stauffer** will retire from the faculty of the University of Minnesota in June. Dr. Emmons has been associated with the University staff since 1911. He is head of

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the department of geology and director of the Minnesota Geological Survey. Dr. Stauffer has been on the faculty since 1914.

Flight Lieut. Leigh W. Bladon, of the Royal Canadian Air Force, has been appointed Macdonald professor of mining at McGill University, at Montreal, succeeding the late Prof. W. G. McBride. **O. M. Brown,** associate professor at the same University, has been promoted to a full professorship, that of ore dressing. He assumes the post formerly occupied by Prof. J. Bell.

Dr. Edward L. Clark, formerly of Joplin, has been appointed Missouri State Geologist by **Governor Donnell** to succeed the late Dr. H. A. Buehler. Dr. Clark, who is 36 years old, was born in Springfield, Mo., and graduated from Drury college there. He majored in geology at Drury and later attended the University of Iowa and the University of Missouri, receiving his doctor's degree from the latter. He returned to Drury as professor of geology from 1932 to 1942. He left Springfield in 1942 to accept a position as regional technical advisor with the mining division of the War Production Board, with headqaurters in Jefferson City, Mo. He later was transferred to Joplin and served as district manager of the local WPB office in January and February of this year. Last March he went to Rolla as Assistant State Geologist under Dr. Buehler. During his stay in Joplin he became well acquainted with Tri-State mining men and the district in general, and his subsequent appointment as state geologist was well received throughout the local mining field.

Obituaries

Charles L. Hawtrey, mining engineer, died in Los Angeles on April 2, aged 87.

Dr. Frank Mueller, president of American Lurgi Corporation, New York, died on May 1.

Julius M. Kuntz, 57, Mesabi mining man, died recently at Nashwauk, Minn. He had been affiliated with the International Harvester Company since 1908. At the time of his death he was electrical and mechanical superintendent for that company's mines, including the Hawkins mine, at Nashwauk, Minn; the Agnew mine, at Hibbing, and the Sargent mine, at Keewatin.

Sir Colin Fraser, geologist and former president of the Australasian Institute of Mining and Metallurgy, and president of the Australian Mines and Metals Association at the time of his death, died at Melbourne on March 10 last at the age of 69.

Sir Stafford F. Kirkpatrick, Canadian mining and metallurgical engineer, formerly president and managing director of Deloro Mining & Smelting Co., died recently in Vancouver, B. C., aged 65.

Raymond I. Jones, superintendent of the Empire Zinc Co. division of the New Jersey Zinc Co., died at Gilman, Colo., on April 5. He was a member of the A.I.M.E.

Dr. Charles Herman Fulton, former director of the Missouri School of Mines and Metallurgy, and professor of metallurgy at Montana School of Mines since 1942, died at Butte, Mont., on April 9 at the age of 70. He had taught at Columbia, the University of Wyoming, South Dakota State School of mines, of which he had been president, and at the Case School of Applied Science, at Cleveland, Ohio.

Cecil James Moe, 43, mining engineer of Hawthorne, Wis., and superintendent of Corsica iron mine, at Elcor, Minn., died on March 18 last.

Edward Magawley Banon, consulting mining engineer, Klondyke pioneer, retired capitalist, and philanthropist, died at his Southside estate near Jacksonville, Fla., on April 13 in his 76th year. Mr. Banon was of English ancestry and came to the United Statees in 1894. He was associated with Marcus Daly in the development of the copper industry, took part in the gold rush into the Klondyke, and was active in the exploration of the McKenzie River region of the Arctic. In 1917 he became associated with Dawes Brothers, of Chicago, as a consulting engineer. He was a member of the A.I.M.E. and many other associations. Mr. Banon supported the Allied cause in the present conflict by providing funds for bombers and ambulances serving the United Nations in Europe.

Rudolph J. Walter, one of Colorado's oldest mining engineers, died recently. As well as having been one of the early mining men of Leadville and Cripple Creek, he was one of the founders of the Colorado Mining Association. Mr. Walter has one son at the New Mexico School of Mines, at Socorro, N. M.

Dr. John Bonsall Porter, senior professor emeritus of mining engineering at McGill University, Montreal, Quebec, died on April 16, in his 83d year. He has been associated with the University for more than 30 years when he retired in 1927. He was a graduate of Columbia School of Mines.

Prof. Henry L. Smyth, of Plainfield, N. J., a geologist formerly on the mining and metallurgical staff of Harvard, who had conducted geological investigations in many parts of the United States, died on April 1 at Plainfield, at the age of 82.

Kenneth C. Shaw, Jr., mining engineer of Fort William, Ontario, died at Manizales, Colombia, South America, on March 13 last. He was a graduate of the University of Minnesota in 1933 and had recently been doing consulting work in Colombia.

Dr. Harry Nelson Eaton, geologist, who was professor of geology at Syracuse University from 1919 to 1928, died at Syracuse, N. Y., on April 12 at the age of 64. He was an authority on the structural geology of Pennsylvania, Utah, New York, and Massachusetts. He had taught at Harvard, Radcliffe College, North Carolina University, and Pennsylvania State College.

Hugh Walter Spaulding, known throughout the silver exchange centers of the world as silver trader for Handy & Harman in both domestic and foreign operations, died March 31, 1944. Starting with his firm in 1902, Mr. Spaulding rose to the position of secretary in 1924, holding this office until his death.

AN APPRECIATION OF H. A. BUEHLER

By H. A. Wheeler

Dr. H. A. Buehler, of Rolla, Mo., died unexpectedly on March 14. In his capacity of State Geologist he was attending a meeting of the State Highway Commission when stricken with a heart attack. His age was 67.

Dr. Buehler, known widely as "the Chief," was one of the best-known and best-loved men in the geological profession. His loyalty to the Commonwealth of Missouri was widely realized and appreciated. He combined rugged manliness with high moral and ethical standards, kindness, and generosity.

"The Chief" was a native of Wisconsin and a graduate of the University of Wisconsin (B.S. in chemistry, 1901). In 1925 he was awarded the honorary degree of doctor of science by Missouri School of Mines and Metallurgy.

His preceptor in geology was Dr. E. R. Buckley, who preceded him as Missouri State Geologist and under whose tutelage Buehler became an ardent descensionist. "The Chief" served on the Missouri Bureau of Geology and Mines from 1901 and 1907, then, after one year with the Federal Lead Co., he became State Geologist and Director of the Missouri Bureau of Geology and Mines in 1908. He held this position until his death. Under him the organization expanded fivefold and did yeoman service for the State.

Buehler was deeply interested in the Tri-State and Southeast Missouri mining districts, and did all he could to assist their development. He was a member of the State Highway Commission and gave important assistance in the location of suitable road materials. Under him the bureau did unusual service in the development and conservation of ground-water resources. When oil excitement developed in the Forest City basin, the State survey reported on the geology of the area and preserved and published the logs of all holes drilled. In 1943 it published the first state-wide gravimetric and magnetic maps in the country.

"The Chief" was one of the founders of the Association of American State Geologists, and was recognized as the dean of state geologists. His organization was considered one of the most progressive and useful of its kind. The regard of the people whom he served was evident from a host of appreciative resolutions from the state legislature and a number of cities and other organizations. At the funeral services in Rolla, Governor Donnell gave the eulogy and all business in the town was suspended for two hours.

Buehler was a member of the Geological Society of America, the Society of Economic Geologists, the American Association of Petroleum Geologists, and the American Institute of Mining and Metallurgical Engineers. He was president of the last organization in 1935.

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REGIONAL NEWS

CALIFORNIA

Idaho Maryland and Empire Star resume operations—Redding iron deposit to be drilled

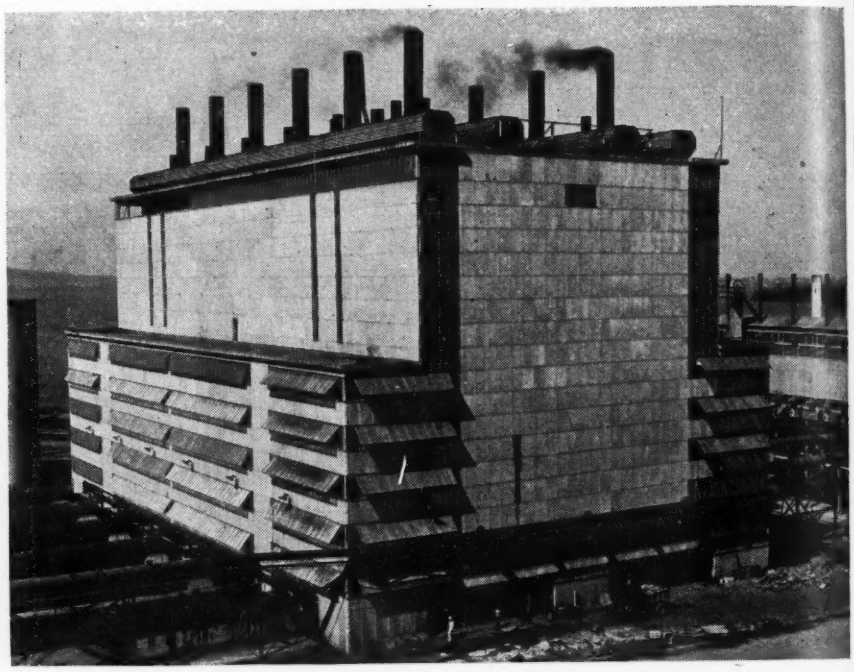
▶ Limited mining and milling operations have been resumed at the properties of Idaho Maryland Mines Corp. and Empire Star Mines Co., Ltd., at Grass Valley, Nevada County, California's premier gold producers before the gold mine shutdown order. This follows the initial WPB action to provide limited production to meet maintenance costs. Manpower and critical equipment and supplies are being made available to the two mines under joint WPB and WMC agreement, which stipulates that all maintenance workers and miners employed through U. S. Employment Service must be non-essential to higher urgency war production, and critical equipment released will also be on prior call to military or other production, although WPB will aid the operators in securing used materials for maintenance requirements. Errol MacBoyle is executive vice president of Idaho Maryland Mines, and Fred Searls, Jr., is president of Empire Star. The last-named concern received in 1943 a profit of $21,050 from the lease of scheelite deposits in its North Star mine to New Verde Mines Co., an Empire Star subsidiary. The lease was canceled after the WPB order permitting maintenance went into effect. Men engaged in this work were transferred to gold-mining operations.

▶ Drilling of the Doak iron deposit near Redding, Shasta County, under lease to G. M. Gray and associates, is scheduled to commence soon. The property consists of about 1,000 acres on the Pit and McCloud rivers, with preliminary exploration work both by the Gray interests and the U. S. Bureau of Mines. Ore to be mined will be used in concrete construction, manufacturing, and for ship ballast.

▶ W. K. Ephriam, formerly superintendent at the Oak Hill property, in the La Grange area of Stanislaus County, has leased the mine from Oak Hill Mining Co. and plans early exploitation, by open-pit methods, of a shallow deposit containing gold, copper, silver, and zinc.

▶ Production of copper-gold ore is proceeding steadily at the properties of Volo Associates, near Placerville, El Dorado County. Output from the Lilyama and Pioneer mines, in the Pilot Hill district, is trucked to the mill near El Dorado, reopened last year and converted from gold to copper mining. Extensive development work is in progress at the mines. F. V. Phillips is president of Volo Associates, O. H. Griggs, general manager, Herbert Rosborough, mine superintendent, James Melone, mill superintendent, and L. Reese, metallurgist.

▶ Rehabilitation work is reported to have been started at the Favot holdings in Tuolumne County, consisting of the Diablo and Feliciana mines, by I. A. and A. E. Davis, the present owners. Besides gold, asbestos and iron are exposed on the claims. A new road from Moccasin Creek to the mines is being completed.



HEARTH ROASTER BUILDING of Nicaro Nickel Co., Freeport Sulphur Co. subsidiary in Cuba. It is part of the DPC-owned $33,500,000 plant now producing nickel oxide by an ammonia leaching process (*E.&M.J.*, Feb., 1944, p. 106) from lateritic iron ore containing 1.5 percent Ni

NEVADA

New Comstock Lode project is planned—Silver Cloud mine is closed—Nye County mines sold

▶ Operating as Virginia City Mining Co., Guy M. Standifer, president of the Dayton Dredging Co., with San Francisco associates, has begun surface mining with a power shovel on property of the Consolidated Virginia Mining Co. at Virginia City. The 400-ton cyanide mill of the Consolidated Chollar, Gould & Savage Mining Co. at Gold Hill, also on the Comstock lode, has been leased and for the present will treat around 200 tons per day, to be mined in broad-scale sampling of the "north-end" mines. Under an agreement with Zeb Kendall, Consolidated Virginia president, the Standifer group has eight months in which to sample the properties, which include the California and Virginia claims, comprising the Consolidated Virginia mine, in which the historic "big bonanza" produced 105,000 tons of silver-gold ore with recovery of $93.35 per ton; also the Mexican, Ophir, and Andes mines, all owned by Consolidated Virginia. Roy A. Hardy, consulting engineer for Getchell Mine, Inc., has been retained as directing engineer for the Comstock lode project, and Clyde E. Collins, long manager of the Overland mine and mill, in the same district, is general superintendent. Contracts have been awarded for power shovel and ore-trucking service. A 500-ton mill is planned for the property.

▶ The Nevada Mines Division of Kennecott Copper Corp., formerly Nevada Consolidated Copper Corp., reported 1943 receipts of $16,424,636 with expenses $16,425,938 and cash balance $400,943 at the close of the year. President E. T. Stannard said drilling below the lowest level of the Ruth mine had failed to disclose an orebody that can be mined with profit under present wage scales and

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CHEMICALS INDISPENSABLE TO INDUSTRY AND VICTORY

Nevada *(continued)*

with copper at 12c. per pound. The flotation concentrator is reported treating upward of 20,000 tons per day. J. C. Kinnear is general manager at McGill. The National Security Award was presented to the Nevada division recently at ceremonies in Ely, with Governor E. P. Carville presiding.

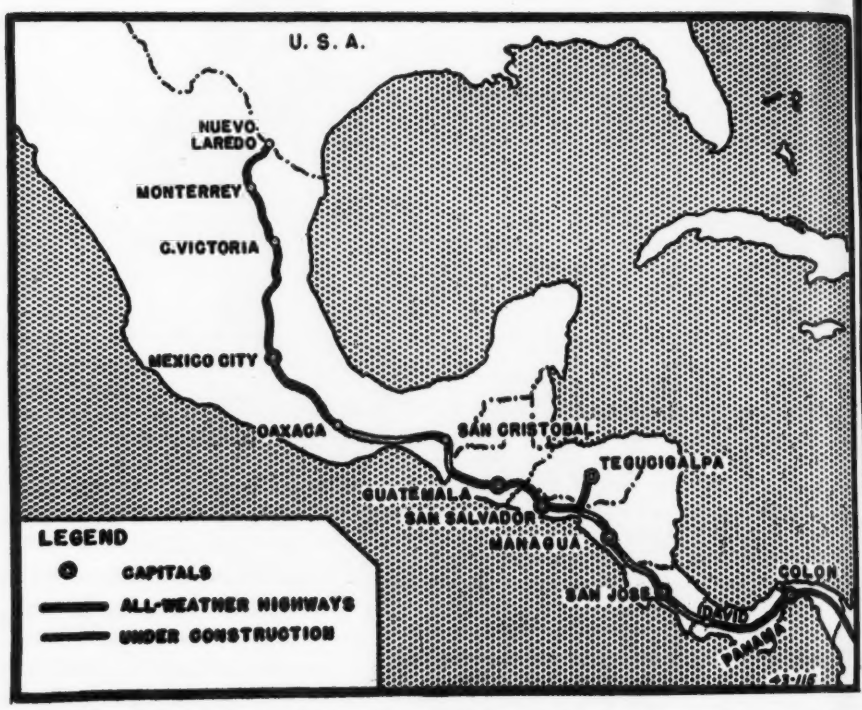
▶ In the annual report of Goldfield Consolidated Mines Co. for 1943, President George Wingfield says there was little production from the Goldfield or Aurora mines, because of conditions adverse to gold mining. Livengood Placers, Inc., 17 percent owned, remained idle, but the dredge and other equipment were protected and the pipe line was completed. The subsidiary industrial division continues to produce powdered magnesium metal for military use. Gross income was $105,227.21 and net profit $52,501.15.

▶ Combined Metals Reduction Co., lately reorganized and operating lead-zinc mines and selective flotation mill at Pioche, with another property in Utah, reports 1943 net profit of $83,498 after all charges, or about 2 percent of net smelter returns. Heavy operating costs, due to undermanned productive workings, high wage scales, and taxes, contributed to the cut in earnings. E. H. Snyder is president.

▶ The Silver Cloud cinnabar mine, in the Ivanhoe district, Elko County, has been closed down, and equipment, including an 80-ton Gould and 60-ton Sirocco furnace, has been advertised for sale. Known formerly as the Maddeford-Smith mine, the property was acquired in 1942 by the Newmont Mining Corp., which formed the subsidiary New Verde Mining Co. and provided the furnaces, mining ore from open cuts and making substantial production. In late 1943 the property was leased to R. O. Camozzi and two engineer associates. Camozzi had been in charge as manager.

▶ Consolidated Coppermines Corp. in 1943 produced 2,738,095 dry tons of ore, nearly all from underground mines at Kimberly, and marketed 41,719,000 lb. copper, 26,450 oz. gold, 58,819 oz. silver, 761,915 lb. zinc, and 154,748 lb. lead, with net profit of $41,363.57 after all charges and dividends of $317,682. At year's end the company had $961,953 cash on hand and $520,481 in government securities. President John A. Payne, New York, said production was increasing from the new open pit on the Tonopah orebody, near the Emma Nevada shaft.

▶ Extensive lode and placer mines of the Nevada Porphyry Gold Mines, Inc., at Round Mountain, Nye County, have been acquired by Guy M. Standifer, of San Francisco, president of Dayton Dredging Co., which, prior to the WPB closing order, operated a 10,000-cu.yd. dragline and washing plant, largest in the U. S. of its type, at Dayton, Lyon County. Drilling on the placer area at Round Mountain during the past year was said to have proved 40,000,000 cu.yd. of pay gravel. Part of this area, worked by the old Round Mountain Mining Co. by hydraulic giants, yielded 90 cents gold per cubic yard. Standifer will drill the lode section of the property and plans installation of a 10,000-yd. washing plant with belt conveyors and power shovels.



UNDER CONSTRUCTION by the Public Roads Administration and the Corps of Engineers, U.S.A., with the cooperation of some of the Central American republics, the Inter-American highway, authorized in 1942, will probably be completed across Guatemala, Salvador, Honduras, Nicaragua, and Panama by July, 1944. The pass over the continental divide in Costa Rica, at an altitude of 10,913 ft., will not be completed until July, 1945. Total length of the highway from the Suchiate River, at the southern frontier of Mexico, to Balboa Basin, in the Canal Zone, will be 2,561 km.

▶ Construction of a 100-ton cyanide mill has been resumed by the Central Comstock Mines Corp. below the portal of the Hale & Norcross tunnel, main outlet of its "middle" group of old bonanza mines on the Comstock lode at Virginia City. Much work had been accomplished, including mill foundations, trestle and underground repairs, when work was halted by the death of A. E. Vandercook, widely known metallurgist and manager for the company. Until the underground mines are better prepared for production, it is planned to treat the Hale & Norcross dump, within power-shovel reach of the mill bins and indicated to contain 290,000 tons of mill-grade ore.

ARIZONA

New Morenci units reach capacity and water supply is improved—Maudina mine works two shifts

▶ Capacity operations are in progress at the Morenci property of Phelps Dodge Corp., following completion of the expansion program started about a year ago. At the pit, where new shovel units, ore and waste cars, and operating facilities have been placed in operation recently, more than 120,000 tons of material is being handled per day, of which 45,000 tons is ore. Eleven new treatment units have been added to the concentrator, making a total of 27, and appropriate additions have been made to the smelter, power plant, water recovery plant, and tailings disposal arrangement. At the smelter three reverberatory furnaces and six converters are in operation. Labor shortage has been somewhat alleviated by the employment of women in the concentrator. The water supply picture has brightened considerably as a result of a Salt River Valley Water Users Association election held on April 4. Shareholders of the association voted approval of the contract for construction of the Horseshoe Dam, on the Verde River, which in turn will permit Phelps Dodge Corp. to divert water from the Black River for use at its Morenci enterprise. G. C. Davis is manager of the Morenci property; E. Wittenau, general superintendent; B. H. Cody, concentrator superintendent; L. L. McDaniel, smelter superintendent, and Walter C. Lawson, chief mine engineer.

▶ About 20 men are reported to be working in two shifts at the Maudina tungsten mine, in the Old Hat district of Pinal County, operated by E. H. Molson, of

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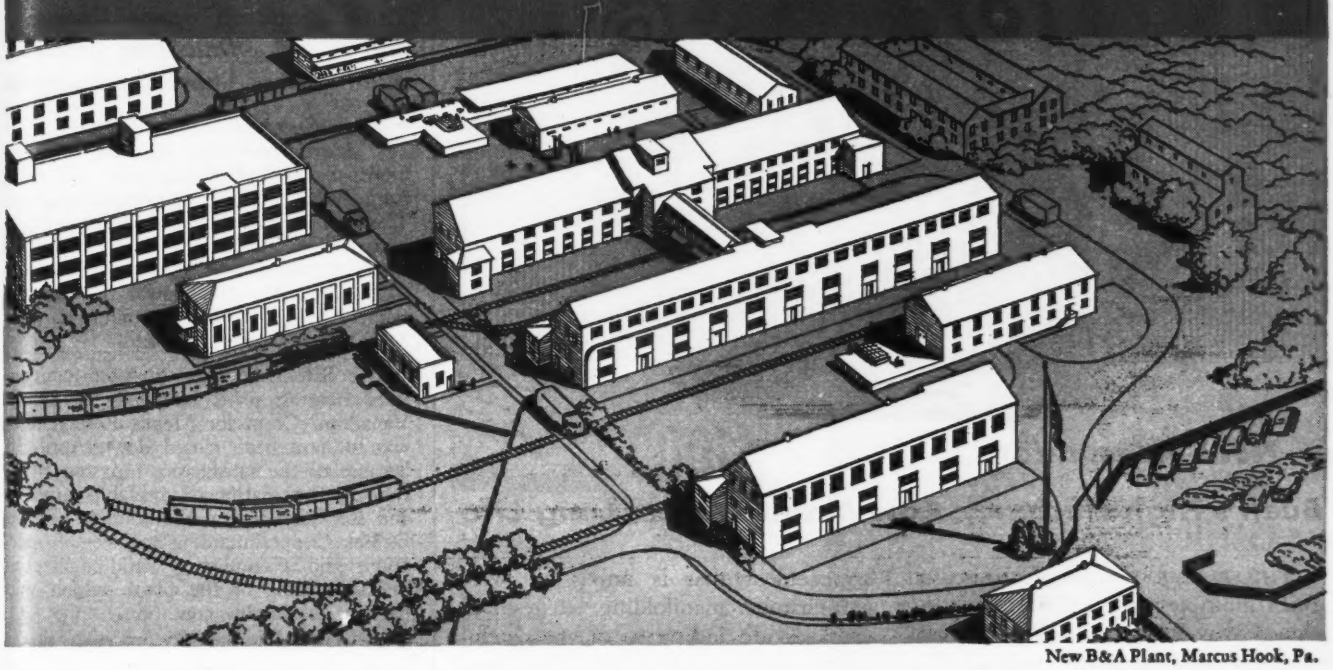

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Arizona *(continued)*

Tucson, who was recently granted a RFC loan for development purposes. Ore mined from an open cut is trucked to the MRC subdepot at the Jacobs mill, in Tucson, under a special MRC permit.

▶ Early production of fluorspar and possible installation of milling facilities are planned by Mines Development Co., which has leased the May property, 16 miles northwest of Hillside, Yavapai County. M. I. Leydig is manager.

UTAH

Tintic Standard opens fluorspar mill—U. S. Vanadium tungsten plant closes—Labor group meets

▶ Tintic Standard Mining Co., on April 22, started operating its new 100-ton fluorspar mill at the Cougar mine, 25 miles from Lund, near the Nevada state line. The mill is producing metallurgical fluorspar for Metals Reserve Co. It is privately financed and cost approximately $175,000. M. H. Howes is superintendent, H. P. Allen metallurgist, and M. D. Paine chief engineer.

▶ The Salt Lake City tungsten concentrate treating plant operated by U. S. Vanadium Corp. for Metals Reserve Co. was to have been closed down April 30 because of the satisfactory tungsten situation in the matter of available supplies and stockpiles within the country. David D. Baker, superintending engineer of operations, said 50 employees would be affected by the closing of the plant, which will be kept in standby condition.

▶ W. H. Gibson, Salt Lake City, lessee of the Wilbert zinc-lead-silver mine and dumps, 12 miles north of Howe, Idaho, has obtained an additional $15,000 mine loan through the mining division of the RFC. The new loan will be used to retire an original $5,000 loan and to rehabilitate a mill, located at the mine, to treat ore from the Wilbert.

▶ Mining at the Horn Silver property, at Frisco, has been resumed. Miller and Clemson, operators of the Penn copper mine, Calaveras County, Calif., are financing the work.

▶ Tony A. Jacobson, leasing the Wasatch Drain Tunnel properties in the Alta mining district, has obtained a $15,000 RFC mine loan for continuing development of copper-lead-silver ore and retiring a previous $5,000 loan.

▶ Labor unions "must not surrender the privilege of collective bargaining to any government bureau or to any other third party" or they soon will find their constitutional privileges and liberties lost, Eldred M. Royle, chairman of the Utah State Industrial Commission, told more than 50 members of district No. 2, International Union of Mine, Mill and Smelter Workers (CIO), at the annual district convention held in Salt Lake City on April 11, 12, and 13. Reid Robinson, of Denver, president of the international union,

told the delegates assembled from throughout Utah and Nevada that they must win their battles "by the ballot box instead of by strikes." He and Adolph Germer, Denver, regional representative, said candidates favorable to labor must be reelected to Congress. Each member of the union is being asked to contribue $1 toward the CIO "political-action" program, and every auxiliary member is being asked to aid in canvassing for votes.

▶Mr. Robinson advised local unions to reopen "unclosed contract negotiations with mine operators" in an attempt to obtain uniform vacation grants and other priviliges. Wage schedules probably will be decided soon by the National War Labor Board, he said. A resolution was adopted thanking Governor Herbert B. Maw for writing to President Roosevelt seeking favorable action on the union's appeal to the NLRB asking higher wages than the 25c. per day increase awarded by the Nonferrous Metals Commission. Ralph H. Rasmussen, international vice president, estimated that if all men under 26 now working in mines, mills, and smelters are drafted into the armed forces in the next several months, production of copper will be curtailed 40 percent.

▶Frank A. Wardlaw, Jr., general manager, International Smelting & Refining Co., Anaconda subsidiary, estimates that an immediate reduction of 20 percent in his company's copper production will follow if its male employees between 21 and 26 years old are drafted according to present replacement schedules. "Men to replace these workers, however, just are not available," Mr. Wardlaw said. "We are training men in subordinate positions to take over more highly skilled jobs, but this will leave vacancies lower down, which will cut into production." The tendency to high-grade mining operations in an effort to hold up production "may catch up to us soon," he continued, "with the result that production may slump badly next year." More development work is a must, he said. International has completed plans for hiring ten Italian prisoners of war to work as a section gang on the Tooele valley railroad, serving its smelter. "Prisoners of war and returning soldiers seem to be our only source for replacements," Mr. Wardlaw continued. He explained that International is ready and willing to employ many returned soldiers having some disabilities, teach them new jobs, and see to it that their work will not overtax them.

COLORADO

A.S.&R. buys Lucky Strike mine, at Kokomo—Durango vanadium plant closes—Ibex mine active

▶Wolf Tongue Mining Co., William Loach, vice president and general manager, subsidiary of the Firth-Sterling Steel Co., began operations at the Cold Spring mine, northeast of Nederland, forty years ago last January, and is the oldest major

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Colorado *(continued)*

tungsten operation in Boulder County. The large mill at Nederland is working only one shift daily because of lack of competent mill and mine help; and it is reported that a car of concentrate is being shipped each month. The company is unwatering the Tenderfoot mine, which lies between the Cold Spring and the Western Star to the north. Considerable core drilling and bulldozing have been done near the Cold Springs property in an endeavor to locate new veins.

▶ George Kimball, manager, has reported a rich strike at the Old Town mine, in the Russell Gulch district, the ore averaging 1.95 oz. gold per ton. The vein is 4½ ft. wide and seems to be holding up as work progresses. One shipment of ore has been made to the Huntington mill, on Chicago Creek.

▶ Shenandoah Dives Mining Co., with James W. Oldham as president and Charles A. Chase, general manager, operates a consolidated group of claims on King Solomon Mountain near timberline, and a 750-ton selective flotation mill on Animas River near Silverton, where ore from the Silver Lake mine and other custom ores are treated. Zinc concentrate is shipped to the A. S. & R. plant at Amarillo, and lead concentrate goes to the A. S. & R. smelter at Leadville.

▶ Lark Mining Co., near Silverton, recently purchased a caterpillar tractor and started clearing the road to the mine, in the Gladstone district.

▶ J. B. Furstenberg reports limited operations at the Stanley and Salisbury mines, near Idaho Springs, and that as soon as manpower and conditions warrant, the scale of operations at the Stanley will be increased.

▶ The option sale of the Lucky Strike mine, at Kokomo, to American Smelting & Refining Co., has aroused considerable interest. This property was opened nearly three years ago by a syndicate of Denver men, and soon after operations started a lead-zinc silver orebody was found. Some 15,000 tons of good ore have since been taken from the workings, and reports are current that A.S.&.R. will continue ore shipments while new exploration work is pushed. Considerable material has been shipped in and a diamond-drilling program is planned.

▶ E. W. Creel, E. E. Wheeler, and associates are making a fine production record from the Monarch vein. Last year they completed the cleaning up, track laying, and retimbering, and the ore was found to be wider and of better grade than expected. Material sorted is producing good shipping ore.

▶ The Ibex mine, Leadville's most prolific and least publicized producer, on Breece Hill, continued throughout 1943 to add to its production record, which has exceeded $120,000,000. This property, operated continuously for more than 45 years, is drained by the Yak tunnel; and under the direction of Byron Wilson has maintained a development and mining program despite manpower shortage. In addition to the company operations, two sets of

leasers make regular shipments of lead ore high in gold to the A.S.&R. smelter at Leadville. The Little Johnny mine is one of the claims in this group.

▶ Harrison Cobb, one of the large tungsten producers in the Boulder area, is developing a new district in Albany County, Wyo. He was one of the first to acquire one of the ultraviolet lamps used to prospect for tungsten, and has demonstrated its value by discovering three commercial bodies of tungsten ore. The Ohio mine, in Bummer Gulch, discovered with this lamp, is the only mine in Boulder County producing scheelite ore in commercial quantities. Cobb has been associated with Gomer S. Sterling in operating the lease on the Wolf Tongue mill tailings pond, which has been the largest tonnage operation in the county, each partner using four trucks, moving between 200 and 300 tons daily.

▶ The vanadium treating plant at Durango, operated by U. S. Vanadium Corp. for Metals Reserve Co., closed down about March 1, according to T. W. Brock, local superintendent. This plant began operation in August, 1942, and treated ores mined in the vicinity of Dove Creek, Uravan, Paradox, and the immediate region, as well as receiving some ore from Rico and Telluride. Excess of vanadium supply over the anticipated demand is responsible for the curtailment of operations.

▶ The Valley mine, 3½ miles east of Leadville in Evans Gulch, was a consistent producer under Harry Sundstrom during 1943, and shipped nearly 4,000 tons of oxide lead ore to the smelter. Sundstrom is now pumping the water from the mine, as ore below the water table is equal to that already mined above the water level.

▶ C. E. Evans has opened some high-grade copper ore in the Cobalt No. 1 mine near Colorado Springs. This property, five miles off the Canon City highway, has been operated by Stevens for the past several years.

▶ Seven men under the direction of Mike Bonan are mining cerussite lead ore from the New Monarch lease, near Leadville. This ore contains some gold and silver, and is near the Valley mine, operated by Harry Sundstrom. They installed an electric compressor during 1943, and mined 850 tons of ore, which was shipped to the Arkansas Valley smelter.

▶ Eugene T. Richards, of Central City, leasing the Stroehle estate, has the Meeker Success mine, in the Russell Gulch district, under development, with orebodies on the 500-ft. level being worked and those on the 400-ft. level diamond drilled. Richards has his own diamond-drilling outfit, which he is using to prospect the property.

▶ Sixty miners with only 45 dozen eggs to eat were snowbound for a few days recently at the Treasury tunnel near Red Mountain Pass, in the southwestern section of the State. The heaviest snowfall of the year, amounting to 4 ft., blocked the road for nearly 12 miles.

▶ P. J. Ruth has a crew of men working

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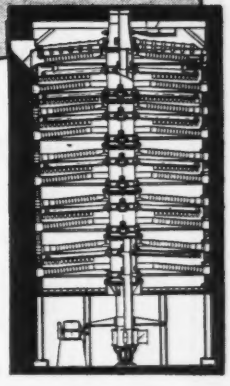

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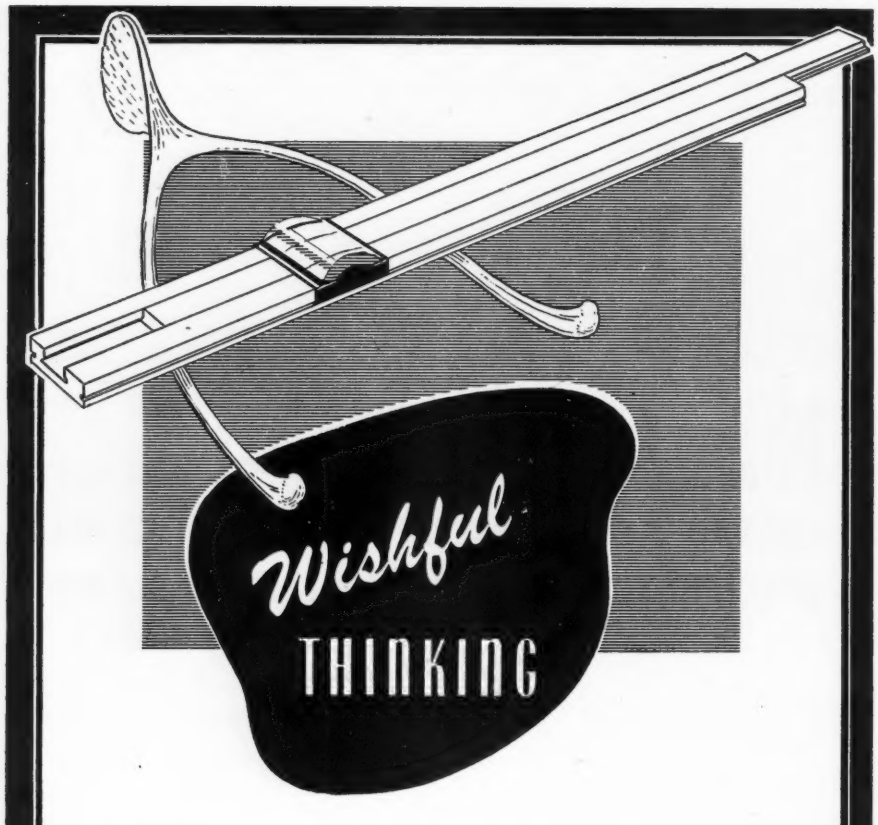

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Colorado *(continued)*

in the Gold Metal tunnel, with the Silver Age ore as their object. He plans to cut this Silver Age vein at considerable depth.

▶ S. L. Harner, operating the California Gulch Mining & Milling Co. on the south edge of Leadville, has changed the flowsheet over completely to the production of strategic metals. In addition to changing over both mills, the company has installed a complete washing plant and set of truck scales. It now treats about 14,000 tons of ore per month that contains zinc, lead, silver, and gold. Part of the ore comes from underground workings, but the bulk of it comes from old complex ore dumps. During 1943, the company produced 2,000 tons of concentrate in addition to a large quantity of iron pyrite necessary in smelter operations and for the production of acids. The dump material is hauled from Breece Hill, where three power shovels and a bulldozer are used to load it into a fleet of 16 5-ton trucks. Tailings from the mills are disposed of behind an earth dam in California Gulch, just below the plant. Adolph Sadar is general superintendent; E. J. O'Brien, secretary; and S. L. Harner is in charge of operations.

▶ The Hope Mining, Milling & Leasing Co. has been reorganized as the Little Annie Mining Co., which holdings include the old Little Annie silver mine. This property, near Aspen, has been idle and in receivership, although some work was done by John L. Herron and associates. The new company is arranging a development program.

▶ The Plymouth mill, in the Montezuma district, started milling ore early in March, with Paul Jones as manager, Joe Shull, mill superintendent, and H. R. Houston assayer and chemist. Having secured contracts from several mines, the mill should be kept in steady operation: and as soon as weather permits, new mines will be added to those already mining and shipping their ore.

▶ Revenue Mines Co. has been organized to continue the work at the Revenue mine, near Ouray, with Allan Hoover as president and L. K. Requa, vice president. William Cutler will remain as superintendent and general manager, and regular production will begin soon.

IDAHO

Hecla operations reported—New hoist for Bunker Hill—Dayrock discovers two new veins

▶ The annual report of the Hecla Mining Co., covering operations for 1943, was mailed to stockholders this month. It shows a net income of $1,045,116.85 and dividend disbursements of $1,000,000. L. E. Hanley, president and manager, advises the stockholders that ore reserves in the original Hecla mine, at Burke, are about exhausted and will be cleaned up during the first six months of this year. Other

mining interests of the company, however, will perpetuate its earning capacity indefinitely. Hecla owns a half interest with Bunker Hill in the big Star mine, which is operated through the Hecla mine shaft by a subsidiary company known as Sullivan Mining Co., which also owns the big electrolytic zinc plant at Kellogg. This company, says Mr. Hanley, paid Hecla a $250,000 dividend in 1943, bringing Hecla's total dividend record as of Dec. 31, 1943, to $26,905,000. The Star mine was not operated at capacity, because of the manpower shortage, but the zinc plant operated at full capacity during the year, producing 41,129 tons of high-grade zinc and 210 tons of cadmium.

▶ Hecla is interested with the Newmont Mining Co. and United States Smelting in the Resurrection mine, in Colorado, which, according to the report, returned a profit of $7,842.65 but failed to maintain its ore reserves. The company therefore deducted $200,555.21 for depreciation and $202,737.53 for depletion in reporting on the operation.

▶ The Hecla company holds a lease on the Silver Cable zinc-lead mine, near Mullan, Idaho, which produces about 80 tons of ore per day. Another Hecla zinc operation is at Blue Moon property, in California, and about a year ago Hecla started construction of a sink-and-float mill of 2,000 tons' daily capacity at Osburn, Idaho, a plant that is described on page 68 of this issue. The company reports that this operation netted $224,643.91 during 1943.

▶ Hecla owns 1,264,500 shares of Polaris Mining Co. stock, and this operation proved the most surprisingly successful mining venture in the Coeur d'Alene district during 1943. The property is operated on a 50-50 partnership basis with Sunshine Mining Co. Hecla's share of the profits from August, 1943, to Feb. 1, 1944, totaled 10c. per share, or $126,450.

▶ In its annual report for the year 1943, Bunker Hill & Sullivan M.&C. Co. announces that its old hoisting plant has reached the limit of its capacity at 2,300 ft., and the company is installing a new hoist at a cost of $561,000. It expects to have the new equipment in operation during 1944. Stanly A. Easton, president of the company, reports 2,874,771 tons of ore blocked out and ready for mining, compared with 2,839,620 tons at the end of 1942. The company's dividend record for 1943 was $1,308,000, making total dividends at the close of the year, $58,750,741.

▶ In the annual report of Federal Mining & Smelting Co. for the year 1943, earnings of the company in the Coeur d'Alene district and the Tri-State field are listed at $1,329,823.94. Comparable figure for 1942 was $1,301,616.53. The figures are before deducting for depletion and depreciation. Taxes, including estimated federal income tax, amounted to $667,307.64 for the year 1943, compared with $651,158.32 for 1942. In reviewing the company's position, President Francis H. Brownell says: "During the year 1943 all of the mines of the company received so-called 'premium payments' from the

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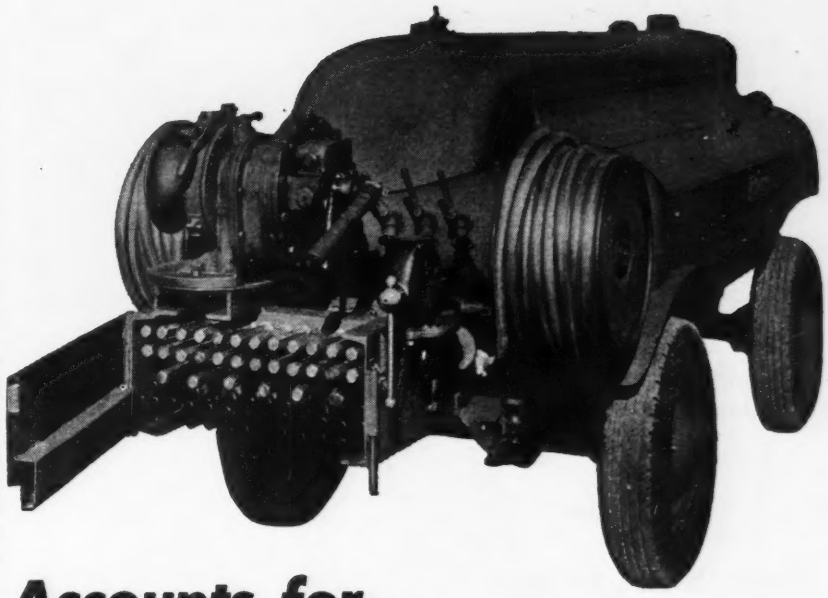

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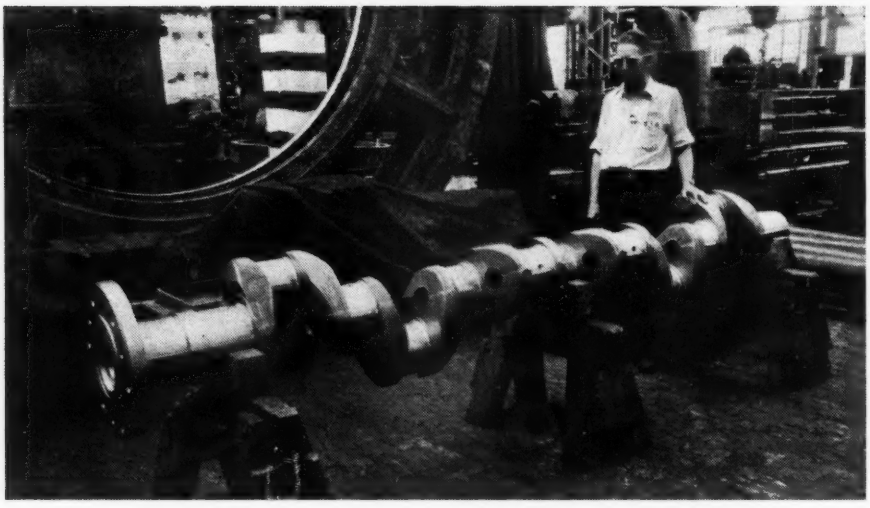

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Idaho *(continued)*

government, which are included in the operating income. Without them, the Frisco mine (in the Coeur d'Alenes) and all of the Tri-State mines of the company would have operated at a loss, and the Morning mine (at Mullan, Idaho) would have made less than $5,000 in 1943 before deducting its proportion of corporate taxes and general administrative expenses." "Direct labor cost per ton of ore mined during 1943 increased 38c. per ton over 1942 for the Tri-State district and 50c. per ton for the Idaho properties. Unless labor costs are lower than at present or prices of lead and zinc are higher than the present ceiling prices, or some combination of these two factors takes place, none of the company's mines (except the Page at Kellogg), will be able to operate at a profit when the government discontinues making premium payments."

▶ Coeur d'Alene Mines Corp. reports a net loss of $42,959.51 in its annual report covering operations for the year 1943. Lessening of silver values in the ore from the 1,400 to the 2,000 level is said to be the cause of the failure to show a profit. Geologists are of the opinion that this is merely a lean zone in the vein system and that better values will be encountered at greater depth. The company has continued the shaft another lift and is now driving a crosscut to the vein on the 2,200 level. In addition to silver, the company produces lead, copper, and antimony. Since March, 1943, the company has received a premium of 5c. per pound on its copper production, which brought in $54,676.10. Since 1939 the company has paid dividends of $550,057,41 and has invested $507,145 in mine and mill improvements.

▶ Clayton Silver Mines Co., operating at Clayton, Idaho, in Custer County, doubled its mineral output during the first quarter of 1944, increasing its lead output by 51 percent and its silver output by 53 percent. The increase has been made possible by the discovery of a new oreshoot, which has been developed for a length of 125 ft. and has averaged 35 ft. in width. The company is operating under an acute manpower shortage, but Manager C. A. Fay says they have been able to keep the 100-ton flotation mill operating at full capacity with only about a dozen men employed, only three of whom are miners. The normal crew is about 30 men. Fay says Clayton's new orebody is unusual in that its mineral contents are "upside down," with the low-grade zinc-lead ores on top near the surface. The zinc has practically disappeared on the 300 level and is replaced with high-grade lead-silver ore. The company has recently installed new pumping equipment and is preparing to sink to the 500 level.

▶ Dayrock Mining Co. reports the discovery of two new veins of ore in the lower workings of the mine, which promise substantial tonnage output in the future. These new veins are independent of the Dayrock vein, which is the company's main production source. Two other veins, the Black Cloud and Panhandle, have been operated by leasers

during the year and have paid royalties amounting to $2,719.82. The Dayrock is equipped with a modern 150-ton flotation mill, which was operated at capacity in 1943 on Dayrock and custom ores. The company employs about 50 men, about half of its regular force.

▶American Smelting & Refining Co. has taken over operation of the Highland-Aurora mining property, in the Beaver Creek district north of Wallace. Terms of the operating contract provide that A.S.&R. is to sink the present mine development shaft to a depth of 1,000 ft., starting on the 370-ft. level where the Highland-Aurora company left off. The smelting company is to be reimbursed the cost of the development work with 90 percent of the proceeds from production, after which the division of profits is to be 60 percent to the A.S.&R. and 40 percent to Highland-Aurora company. Operations are now going ahead under the management of Federal Mining & Smelting Co., of which H. G. Washburn is resident manager.

▶Federal Mining & Smelting Co. has tried to overcome the manpower shortage during the past year by milling its old mine dumps. The company has just cleaned up its No. 5 tunnel dump, which produced about 40,000 tons of low grade zinc-lead ore, and is now working on the No. 6 dump, from which 50,000 tons was removed last year and milled in the Morning plant. The company has two or three other dumps high up on Chloride Mountain which will probably be milled this summer. Production of the Morning mine has been at only about half capacity since the war started.

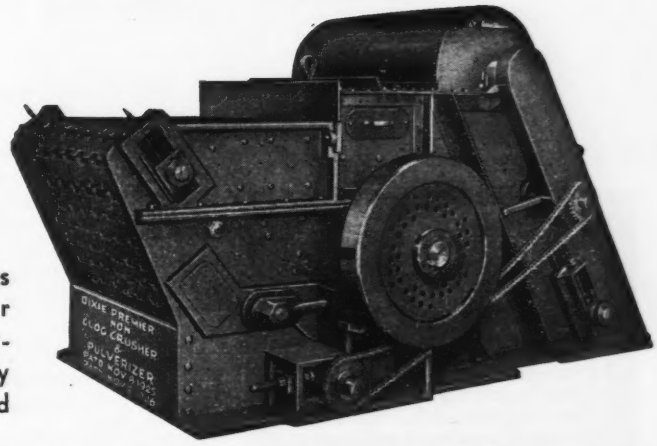
▶The ore shoot recently opened at the Lucky Friday on the 800 level has been opened for 120 ft. in length, showing a width of high-grade ore from 2 to 7 ft. From this development the company has shipped 1,500 tons of ore to the Golconda mill for treatment, and expects returns of about two carloads of concentrates.

MONTANA

New company to work Little Pittsburgh mine—ACM closes Steward shaft—Phosphate mine to open

▶The newly organized Pittsburgh Silver Mining Co. is taking over the Little Pittsburgh mine, near Keystone, in Mineral County. Pittsburgh Silver Mining Co. has consolidated with Nancy Lee Mining Co. and the Little Pittsburgh company, and stock in the other two is to be exchanged for stock in the new company. The Little Pittsburgh vein is crosscut by a 3,000-ft. adit that was completed by Nancy Lee Mining Co. last year. The Nancy Lee company was unable to hold this adit open because of heavy ground in a faulted area in which the last 600 ft. of the crosscut was driven, although it was retimbered twice. The new operators plan to drive 700 ft. of new crosscut to get around the heavy ground. Little Pittsburgh ore contains silver, lead,

GOOD BYE MR. CLOG



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Montana *(continued)*

and gold. Pittsburgh Silver Mining Co. was organized by Eugene Keesey, of Kellogg, Idaho.

▶ The U. S. Bureau of Mines is continuing the search for possible deposits of iron ore of commercial size and grade in Montana, and a crew from the Bureau's Helena office is studying the iron ore-bodies of the Southern Cross area, in the Georgetown district of Deer Lodge County. The Southern Cross mine was once a well-known and important producer of gold ore, but in addition to the gold ores there are extensive bodies of magnetite replacing the Hasmarck limestone through the area. It is these magnetite bodies in which the Bureau of Mines is interested. In Judith Basin County the Bureau is contemplating a magnetometer survey of the Running Wolf iron ore deposits. Trenching and drilling of the Running Wolf deposits to date has failed to find a sufficient quantity of ore to make them commercially important. The last hope appears to be the chance of extensive blind replacement orebodies existing in the limestone—that is, bodies that do not show on the surface. If such bodies exist, it is hoped that a magnetometer survey will locate them.

▶ North Butte Mining Co., Butte, has completed the long and difficult task of unwatering the Granite Mountain mine, repairing the Granite Mountain shaft, and cleaning up the old mine drifts. The mine will soon be ready for development work to begin. Prior to 1931, when the mine closed because of the low price of copper and zinc, it was the second largest metal mining operation in Montana. Some of the Granite Mountain copper orebodies are being mined by Anaconda Copper Mining Co. by way of the Badger shaft, under an operating agreement between North Butte Mining Co. and the A.C.M. Paul A. Gow, Butte, is president and general manager of North Butte Mining Co.

▶ National Boston-Montana Mines Corp. is reported to have effected a reorganization and is said to be out of receivership. The company owns the Elkhorn mining property, on Wise River, in Beaverhead County, and mining property in the French Gulch District of Deer Lodge County. The mines have been closed since 1926, and efforts are now being made to get them back into operation. W. R. Allen, Wise River, is in local charge of the company's affairs.

▶ Anaconda Copper Mining Co. announced on April 21 that the Steward mine shaft was to be closed at once. Closing of the shaft is the result of a decision to concentrate the limited manpower available in those mines from which the greatest amount of copper can be produced per man-shift. There has been a definite shortage of miners for some time, and the lifting of the restrictions on the drafting of the younger miners will accentuate this condition.

▶ International Minerals & Chemical Corp. expects to begin production in a small way at the Douglas Creek phosphate property, in Montana, which it

acquired last year, together with a second group of claims known as the Avon. The Douglas Creek group includes lands on which the Northern Pacific Railway did considerable development work ten years ago, and International has added to these other lands leased from the Government. In 1943 the company explored and sampled these areas. Louis Ware is president of International, and Franklin Farley is vice president in charge of phosphate operations.

WASHINGTON

Northwest aluminum plants face no curtailment — Tungsten produced from old Germania mine

▶ Congressman Fred Norman, of Washington, reports that he has been notified by the WPB that there is no immediate prospect of curtailing operation of aluminum plants in the Northwest. C. E. Wilson, executive vice chairman, in writing to Mr. Norman for Donald Nelson, WPB Chairman, has stated that the board is convinced that the manpower shortage has been overcome in the Vancouver and Longview, Wash., and Troutdale, Ore., areas.

▶ Electro Metallurgical Co. has been assured that its magnesium plant at Spokane will continue to run at its present capacity. Its production has been frozen at 50 percent of rated capacity, but it has not operated at more than 50 percent capacity.

▶ R. H. Mills, of Spokane, is producing tungsten at the old Germania mine which he purchased from the General Electric Co., and is trucking the ore 50 miles to Spokane, where it is taken by Metals Reserve Co. He first puts it through a crusher and jigs, which give him values as high as 70 percent WO_3. He takes his wolframite ore from stopes beyond the 1,000-ft. point in the 1,500-ft. main tunnel. From a short prospect tunnel 100 ft. above he expects to get scheelite ore, which he will treat by flotation. When there is water available, he will also mine this tungsten ore by placer operations, but this year there is not much water in that district. At present he is employing a dozen men, but may double the crew later. He purchased this property for $40,000.

▶ American Zinc, Lead & Smelting Co. last year produced 81,881 tons of milling ore from the Grandview mine, and 46,322 tons of ore from the property of Metaline Mining & Leasing Co., in the same district, according to Howard I. Young, president of American Zinc. From the Grandview ore 7,885 tons of lead and zinc concentrates were produced and from Metaline Mining & Leasing ore 3,883 tons of lead and zinc concentrates. In the Grandview property 2,922 ft. of drifts and raises were run last year and 5,510 ft. of surface drilling and 10,840 ft. of underground drilling. Mr. Young says the manpower situation improved toward the end of the year.

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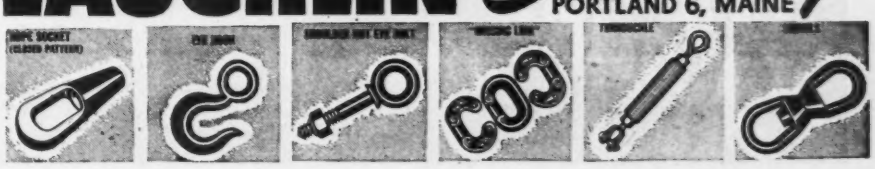

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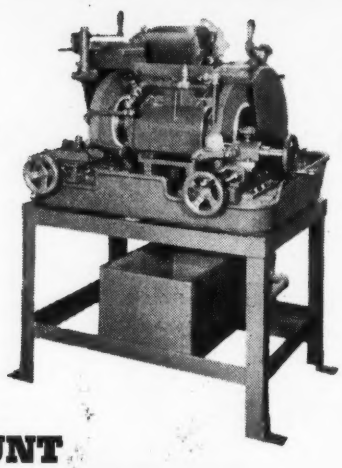

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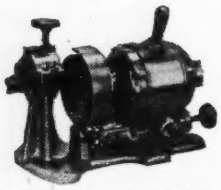

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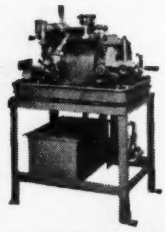

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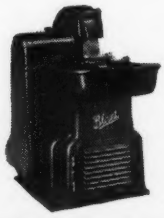

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TRI-STATE

Joplin prospect crew strikes rich ore—M. & W. sinks new shaft—Sciota Milling Co. closes plant

▶ With no let-up in the rate of induction of men into the armed services, manpower continued to be the number one factor in maintaining production in the Tri-State district during April. Some major companies in the district already have closed certain of their properties and shifted their dwindling labor supply to keep other mines working on an efficient basis. Mechanized mining, featuring particularly the recent application of "jumbo" machine drilling operations by at least one major company on an expanded scale, has done much to hold the weekly output rate in excess of 7,500 tons.

▶ M. & W. Mining Co. has started the sinking of a new shaft on the northeast 40 of the old Eastern Lead & Zinc Co., or Huttig lease, a mile northeast of Picher, according to I. W. Andrews, of Joplin, superintendent. A sinking and hoisting derrick was moved from the No. 6 shaft to the new shaft site, which will be designated as the No. 7 mine shaft. The shaft, which is situated about 150 yards east of the No. 3 shaft derrick and hopper, will be put down below the 200-ft. level, Andrews said. When the shaft is completed, ore will be trucked to the No. 1 mill of the Beck Mining Co., nearly a mile to the southwest, for treatment. The company sunk a new shaft on the Brewster "96" lease, which adjoins the Huttig on the east, in 1942, ore from which, as in its other operations, is trucked to the Beck mill, which also furnishes air for underground machine operations.

▶ An exceptionally rich zinc-lead ore strike as a result of several weeks of churn drilling on the Missouri Lead & Zinc Co.'s land in the southeast part of Joplin has been reported by the M., A. & B. Mining Co. According to W. D. Brittain, of Joplin, one of the partners in the company, the shallow deposit of ore was drilled out on virgin land of the 40-acre lease near what would be 22d St. and Wisconsin Ave. were the streets plotted on the tract. The site of the strike is only a few hundred yards west of the Kansas City Southern main-line tracks. Five holes were put down, and the orebody ranged from a depth of 33 to 62 ft. Cuttings from the No. 1 drill hole assayed 59.70 percent zinc and 0.64 percent lead at the above depths. Another sample, from the No. 4 drill hole, assayed 47.50 percent zinc and 1.78 percent lead from the 37 to 50-ft. levels, Brittain said. The two assays, which were run by C. V. Millar, Joplin assayer, were reported to have been of the richest he had ever assayed. The company has started the sinking of a shaft in the drilled area. Associated with Brittain are Greoge Minshall, veteran Joplin driller, and Harold Andrews, also of Joplin.

▶ Operations have been suspended for an

indefinite period at the tailing mill of the Sciota Milling Co. in the southeast part of Webb City, according to Sam A. Smith, of Oakland, company manager. Present operating conditions and costs entered into the decision, Smith said.

▶ Glenn Richey, of Joplin, has leased the Lucky Jack mill, on the Roth land, a mile east of Smithfield, and is operating it to treat ore from the Richey-Thomas mine, a half-mile to the northwest, and other custom ore in the area.

▶ Sam F. Callahan and Sam Walter have encountered some lead and drybone ore in sinking a shaft on a 40-acre virgin tract of the former's land at Spring City, south of Joplin.

▶ W. E. Wrather, director of the U. S. Geological Survey, has announced the preparation of a preliminary map of part of the Picher zinc-lead mining field, showing in colors the geologic structure and the distribution of dolomite in the mines. An intensive investigation of the Kansas-Oklahoma section of the mining field was begun by geologists of the Survey several years preceding the outbreak of the present war, and special attention was directed to the study of parts of the field. The study was headed by E. T. McKnight, assisted by R. P. Fischer, C. C. Addison, K. R. Bowie, J. M. Thiel, M. S. Owens, Jr., and F. G. Wells. Copies of the maps may be obtained by writing the Geological Survey at Washington.

▶ Preparations are being made by James Creech, of Joplin, and associates to reopen the Johnson mine, on the Drake land, south of the Newton-Jasper county line and west of Connecticut Ave., south of Joplin.

ARKANSAS

Hendricks concentrator is now operating steadily — Mattie May plans expanded operations

▶ Fighting wet weather, which is unsuitable for manganese mining operations in the Batesville-Cushman field, operators there raised their production in March approximately 622 tons over February. Total production in the field in March ran to 2,032 tons, high grade and low grade. All of the low grade produced in March went direct to the furnaces, the high grade being purchased by the Metals Reserve buying depot at Batesville. Increase in production was brought about by the furnace demand for low grade and by new plants in operation.

▶ Hendricks Mining & Milling Co., Batesville, operating the Southern Hill, Polk Southard, and other properties, has a large washing and concentrating plant in steady operation. Alvin Hendricks is general manager, Joe Jeffcoat superintendent, and W. B. Hearrell sales manager. Bob Stubblefield is in charge of stripping operations on Southern Hill, and Doc Singer is in charge of operations on the Sis Clark, where a small washing plant is also run-

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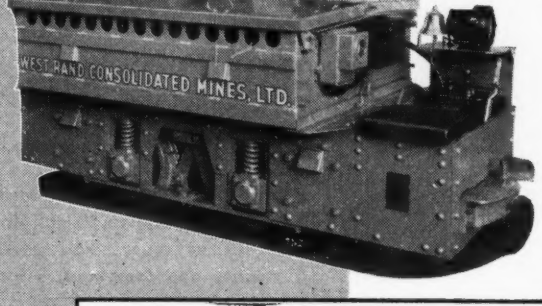

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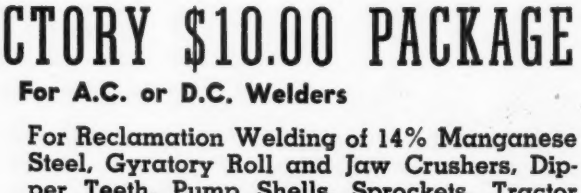

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Arkansas *(continued)*

ning. March Production ran to approximately 217 tons of high grade and 200 tons of low grade. All of the high grade was recovered from crude ore in the local plant. The company continues to improve its mining equipment. All operations on the Southern Hill and Polk Southard, which supply the crude ore for processing at the plant, are open-cut and stripping operations. The company is now using three power shovels, one bulldozer and one large scraper to do this work, and nine trucks to move the crude to the mill. On April 6 Alvin Hendricks was host to an open-house luncheon held at the plant. A large number of guests attended and got a clear picture of what a plant of this kind is worth to this section.

► Walter H. Denison Manganese Co., of Cushman, Reed Denison in charge of operations, was the largest producer in the field in March. Its total production ran to 700 tons, 650 tons of which was low grade. Most of the production came from the Bill Jim, Wildcat, and Ozark, all of which are making a good output. Walter H. Denison is probably the oldest manganese producer in the United States. He started in the industry about 60 years ago and has been in it ever since.

► Arkansas Manganese Co., of Cushman, Jack Gibbons in charge of operations, was the second largest producer in the field in March. The company operates the Aydelotte property, near Cushman, and has for many years been among the largest producers in the field. March production ran to 485 tons, 179 tons of which was high grade and 306 tons low grade.

► E. & A. Co., headed by James Wood, operating engineer, and Max Cohen, work manager, of Batesville, produced 50 tons of high-grade ore in March. This ore was raised from low grade to high grade on the Company's plant at Batesville, on the Bayou, which furnishes the necessary water. Operations on the Lafferty Creek property were expected to be under way in March, but were held up by bad weather and other difficulties. The company plans to have the property in operation in April. It also plans to replace the plant it is operating in Batesville by installing a larger and more complete plant.

► Charles Sims, of Cushman, who is operating the Tate and Einstein properties, near Cushman, produced 75 tons in March, 25 tons of which was high grade and 50 tons low grade. Mr. Sims is sinking four new shafts on the properties, which were planned to be in production in April.

► Increased production in the field is crowding Metals Reserve's buying depot ore yard, two and a half miles northeast of Batesville. Major Ruggles, in charge of the depot, has his office in Batesville. Within the next few months Metals Reserve will have to expand the yard. It will install a set of scales at the yard early in April.

► The Norfolk Dam, under construction on the Norfolk River, near Mountain Home, in Baxter County, will be completed this year. It is one of the six

largest concrete dams in the United States. One generator with a capacity of 35,000 kw. is being installed. Three more will be installed after the war. Power from this dam will be available for mining operations in north Arkansas. Earl Berry has been placed in charge of the sale of power and has his office in Mountain Home.

▶ Though production is still at a low ebb in the north Arkansas zinc and lead field, operations are expanding and by late summer should show a big gain. Rainfall in March was heavy, which retarded operations.

▶ Moark Mining Co., in charge of C. T. Rabineau, operating the Almy, Red Mill, Jack Pot, and other properties near Zinc, keeps its little mill in steady operation, and produced one car of high-grade silicate of zinc concentrate in March.

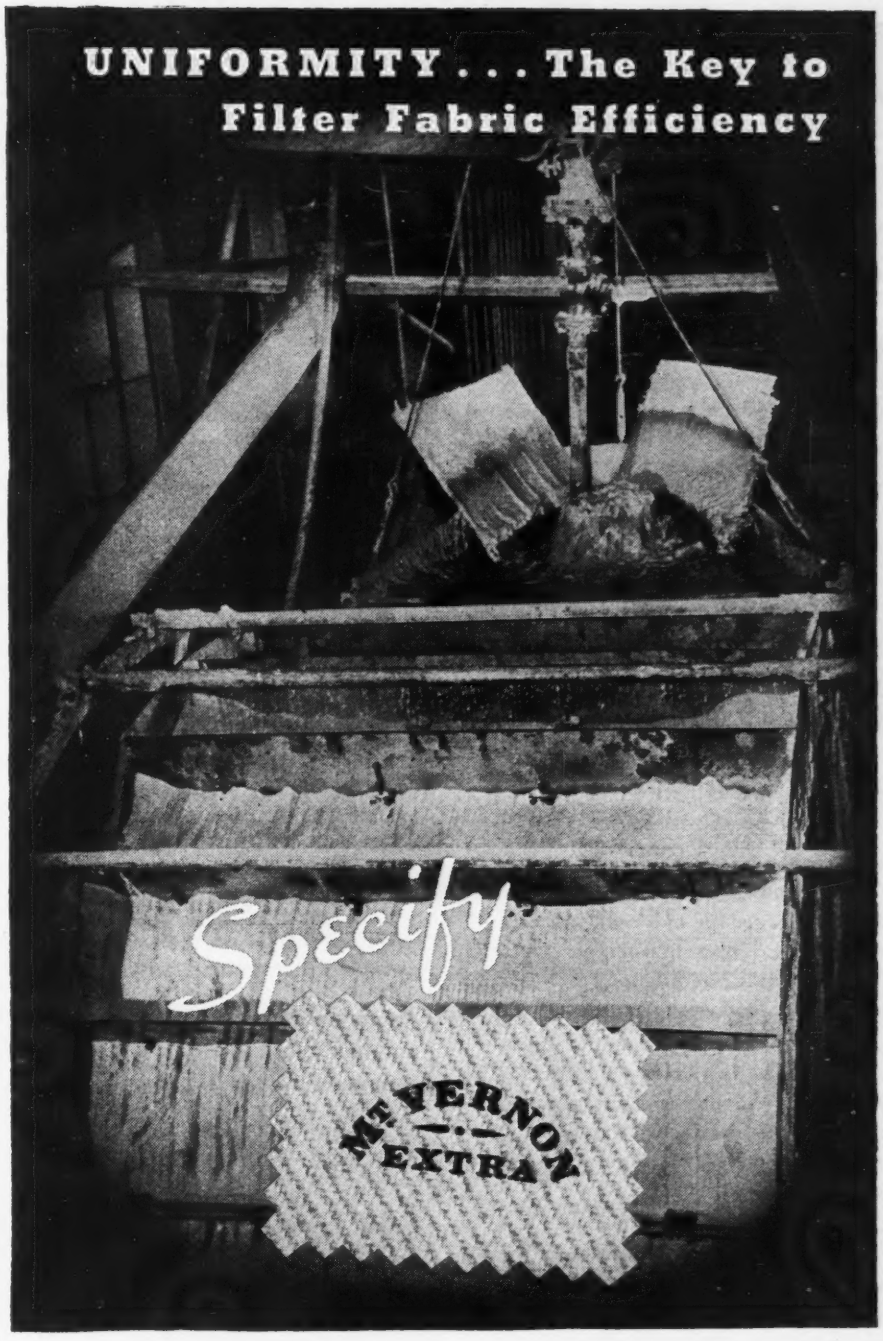
▶ Advance Mining & Engineering Co., John Stone, of Harrison, in charge of operations, has its new dry-process plant nearly completed. Ore faces are opened up, and the plant may be in operation the latter part of May.

▶ The Bureau of Mines is completing its last test hole on the Coon Hollow property near Zinc. Whether the Bureau will do any more exploratory drilling in the field is not known.

▶ Construction of the big new milling plant at the Big Hurricane mine is well under way, and it is expected that it will be in operation within the next six weeks. The property is in the hands of the S. & G. Zinc Mining Corp. J. Tom Grimmet, of Oklahoma City, is president, and J. C. Shepherd, of Harrison, in charge of operations. The upper structure of the orebody carries carbonate in clay. Stripping operations will be conducted with a bulldozer and the crude will be move with a big dragline. Mr. Shepherd operated this mine during the first World War, and made a good prouction.

▶ Operations on the Mattie May, in the Rush Creek area in Marion County, are progressing favorably. The property is in the hands of Roy Morrow, of Yellville, and associates. They have their main tunnel back to a depth of 250 ft. and their ore face is now 75 ft. wide and 6 ft. high. The upper 3 ft. of the face is carbonate of zinc and the lower 3 ft. very rich jack. They also have leases on the Buelah, Mariehattieana, Houston, Mulholland, Climax, and Yellow Jacket No. 2, and they have a large deposit of iron on land adjoining Yellow Jacket No. 2. Their mining equipment consists of a compressor, waterline drill, cars, mine track, and a well-equipped blacksmith shop. They plan to build a large modern central milling plant soon to handle crude ore from their own properties and to do custom milling. They also plan to set up a small laboratory and to buy ore.

▶ J. C. Jones, in charge of operations for Hall Mountain Mining Co., Yellville, has the new Wickersham tunnel back to a depth of 65 ft. The company has encountered one good lead of jack and a white ore, which is thought to be marionite, a high grade zinc carbonate. The new tun-



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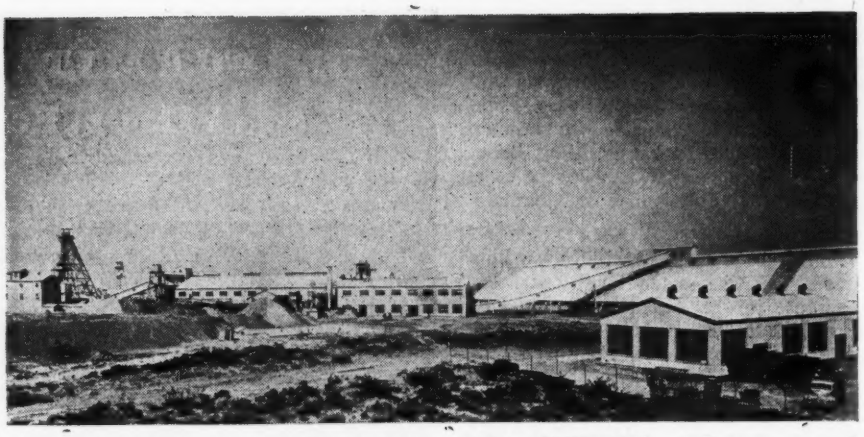

POTASH MINE SURFACE PLANT AND REFINERY of International Minerals & Chemical Corp. in the Carlsbad district, New Mexico, from the rear. Left to right: the crushing plant, shaft No. 1 headframe, crushed-ore storage bins, concentrator and refinery, which delivers by inclined conveyor to top of storage building. Shuttle car haulage in this mine is discussed on pp. 62 to 65

Arkansas *(continued)*

nel is well equipped with mine tracks, cars, electric lights, and air drills. With the ore developed in the Truex, and the new leads found in the Wickersham, it is expected that the company will soon start construction of a milling plant.

MICHIGAN

Copper recovery from tailings exceeds estimates—No. 2 Centennial shaft now producing

▶ Thirty years ago, on March 1, 1914, it was estimated that by re-treatment the rich conglomerate tailings in Torch Lake would yield Calumet & Hecla 375,000,000 lb. of copper. The estimate was conservative, for the total amount of copper reclaimed by the first of the present year from the Calumet & Hecla and Tamarack deposits was 479,351,977 lb. It is believed this total will reach or even exceed 500,000,000 lb. by the close of this year.

Conglomerate tailings are all but exhausted. The few remaining scattered portions at Lake Linden will be dredged during the early summer months. The lower-grade amygdaloid sand bank at the Calumet plant has been working during the winter months, and at the Tamarack plant the dredge is working in the mixed conglomerate and amygdaloid zone. This plant is being remodeled for most economical treatment of the amygdaloid sands. Production in the future is entirely dependent on the price of copper. It is estimated that about 6,000,000 lb. of copper will be recovered from the remaining conglomerate tailings at the Calumet plant. Operations in the amygaloid now are possible only because of the war demands for copper, at a premium price.

Thirty years ago it was estimated that the recovery per ton of conglomerate tailings treated would be 10 lb. The actual recovery has been better, having averaged about 11 lb. Estimated cost was put down at 7c. Actually it has been less than 6.

In the 30-year period the Calumet plant was shut down for a period of four and a half years, and the Tamarack plant for more than six years, due to low price of copper.

▶ No. 2 Centennial shaft of the Calumet & Hecla Consolidated Copper Co. is now in production, the first output of ore from this shaft since 1931. This resumption completes the roster of old Calumet & Hecla properties that have been rehabilitated to aid in the war effort. Centennial production will be brought to a peak as rapidly as possible. Some veteran employees have been transferred to Centennial or have been taken on to provide a nucleus of experienced workers. Modern equipment has been installed throughout and exploratory work will be carried on vigorously. The pumps operated from May 20, 1942, to March 1, 1944, with only 12 percent lost time due to column installation, electrical work, and pump installation, and delivered to surface a total of approximately 1,040,000,000 gallons of water. At the start the water was 62 ft. below the 25th level. At present the water is below the 41st level.

IRON COUNTRY

Duluth harbor opened on Easter Sunday—Arbitration board votes against Inland Steel union plea

▶ The Lake Superior Iron Ore Association has reported that stocks of iron ore at Lower Lake docks totaled 21,332,964 gross tons as of April 1, compared with 25,088,209 tons of the same date a year ago. Although nearly 4,000,000 tons under the April 1 tonnage of last year, the report indicated that stocks would not reach the low point of May 1, 1943. Stocks declined to 18,496,988 tons on May 1 last

year, when the Great Lakes fleet had a late start.

▶ Pickands, Mather & Co. has undertaken the exploration of iron-ore properties near Florence, Wis., on the Menominee Range. The properties in the past have been known as the Commonwealth group and are comprised of the Badger, Commonwealth, and the Buckeye. The group of mines was originally operated by the Commonwealth Iron Co., and later by Oglebay, Norton & Co. Operations began in 1880 and shipments stopped in 1916.

▶ Interlake navigation opened Easter Sunday, April 9, at the Duluth-Superior harbor. The steamer "Cadillac," of the Cleveland-Cliffs Iron Co., led the way through the Duluth ship canal, to the cheers of several thousand people assembled to witness the first arrival of the 1944 season. The "Cadillac" is one of the new Maritime Commission boats and was put into service during the 1943 season. The earliest opening on record was March 26, 1942, made by the steamer "W. G. Mather," flagship of the Cleveland-Cliffs Iron Co.'s fleet.

▶ Opening of navigation at the Escanaba docks, on Lake Michigan, was delayed by cold weather until April 5, when the steamers "L. E. Block" and "P. D. Block" left with over 20,000 tons of Inland Steel Co. ore from its mines, the Sherwood, at Iron River, and the Morris, at Ishpeming. For the run from Ishpeming to Escanaba the Chicago and Northwestern Ry. is using a new, heavier-type locomotive capable of pulling a 17 percent greater load at an increased speed.

▶ On April 9 at 8:30 p. m. the "Pam Schneider," of the Cleveland-Cliffs fleet, arrived in the Marquette, Mich., harbor with a cargo of coal. She was met by a reception committee from the city, who presented the captain with a ship's barometer. The same day the steamer "Powell Stackhouse," of the Bethlehem fleet, arrived off the port of Ashland, but the ice fields were so heavy she did not get to the Northwestern dock to load ore until April 12. The ice jams at Whitefish Bay were broken up by the St. Marie car ferry, but the continued cold weather and north winds hampered operations and held the boats to slow schedules.

▶ At the Penn mines, near Norway, Mich., on the Menominee Range, operated by Pickands, Mather & Co., the yearly ore production dropped in 1943 to only 463,896 tons, compared to 875,562 tons in 1942. This was due to necessity of driving additional levels through rock in the West and East mines, to reach the orebody. The rock tunnels are now completed, and full ore production is being maintained that should boost the 1944 production again to 850,000 tons. Harold Richards is superintendent of this mine group.

▶ The three-man arbitration board to rule on the request of the Sherwood mine CIO local union that two men be assigned to each drill in hazardous underground operations voted against the request in a two to one decision. The board, consisting of Victor Laing, company representative; Sam Swanson, union nominee, and Judge Edward Kenney, of Duluth, submitted copies

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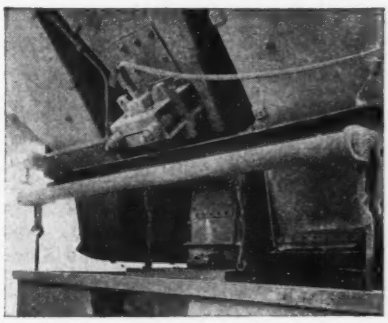

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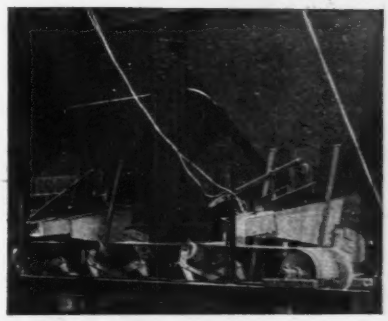

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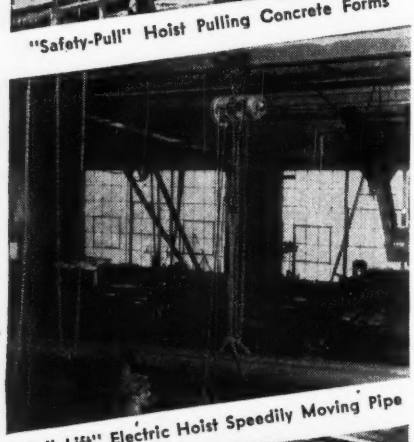

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Iron Country *(continued)*

of letters of their opinion which were forwarded to the USW-CIO office and to the Inland Steel Co. in Iron River, Mich. The decision affects not only the 1,700 miners on the Menominee Range, but all underground mines in the Lake Superior region.

▶ Labor is getting so scarce at both open-pit and underground iron-ore mines that it has been necessary for some operators to shut down one of three shifts per day and use the men released from the idle shift to fill in and carry on full production on the other two. The present understanding between the mine operators and draft boards is that no deferment will be asked for men under 26 years of age as long as the draft boards will allow men over that age to be retained.

▶ In previous years the hearings on mine valuations for the Marquette Range were held at the Ishpeming city hall, as most of the mines are in Ishpeming and Negaunee. This year the hearings are called for 10 a. m. May 8 at the court house in Marquette, Mich. The mine appraiser for the State Tax Commission, Frank G. Pardee, has completed his inspection of properties, and the valuations on mines will be based on the commission's study of his reports. The mine operators are given this opportunity to object to the valuations set by the State if they seem too high. Few complaints are brought in for discussion compared to the total number of mines reviewed.

ALASKA

Alaska Juneau mine is closed—Dall Island gold development is studied—Navy explores oil lands

▶ Alaska Juneau Gold Mining Co. has closed its gold mine at Juneau, according to an Associated Press dispatch. Joe Williams, general superintendent, said the shutdown was necessitated by the awarding of a 14c.-an-hour increase in wages granted recently by the WLB. Approximately 225 men were affected. The company's net loss in 1943 was $174,346, compared with a net profit of $237,626, or 16c. a share, in 1942. Alaska Juneau has contemplated for some time the necessity of closing the mine, but had deferred action hoping for a modification or rescinding of the 14c. wage increase. "Your company during the last year suffered curtailment through losses of crew from a normal of about 1,000 men," said P. R. Bradley, president. "This has been disastrous financially because the marginal character of operations requires the maximum tonnage output for earning a profit. It has been the policy to conduct operations in a manner that would result in the least loss, and therefore milling and mining were continued on the best scale possible with the available crew. It is quite impossible to forecast the future, which depends on the war and many industrial conditions that will follow. No sacrifices have been made unduly to favor production, neither was any effort made to 'rob' the mine of its better-grade ore which would unfavorably affect future operations." Average daily wage of Alaska Juneau in 1943 was $8.58, against $7.67 in 1942. Henry I. Lucas, mayor of Juneau, and F. R. Lewis, of San Francisco, and president of the Juneau Water Co., and C. A. Norris, official of Alaska Juneau Gold Mining Co., while in Washington, D. C., recently, conferred with members of the WLB regarding an increase in miners' wages. Lucas said he was fearful that the mining company, which is vital to the life of the town, would suspend operations if obliged to pay the wage increase. He also said that the power and water facilities of Juneau would be affected seriously if the mine closed down. He did not question the economic desirability of the wage increase. He also urged that some payment be made for the rock supplied by the mine for water-front fills. The Army engineers he stated have estimated the value of this rock at $1,350,000, and he said if some payment could be made to the mining company for this rock it would offset the company's additional labor burden.

▶ John Bufvers last fall located the old McLeod Bay gold quartz claims on Dall Island, said to be the largest orebody in southeastern Alaska, next to the Alaska Juneau mine, and like the latter is composed of low-grade ore. Mr. Bufvers reports that engineers have come from Canada to inspect the property since he made the locations.

▶ The U. S. Navy, according to reports, intends to spend $1,000,000 in exploring the naval oil reserve on the Arctic coast of Alaska this summer. It is proposed to drill wells to a depth of 10,000 ft. if necessary. Surveys were made last summer.

▶ The U. S. Geological Survey has reports and maps concerning fluorite reserves at the Lost River tin mine, concerning nickel and copper deposits at Mirror Harbor, Chichagof Island, in southeastern Alaska, the Herendeen Bay coal field, and scheelite in the Solomon district on Seward Peninsula.

▶ Al Anderson, secretary of the Alaska Mining Association, stated in March, in Fairbanks, that the manpower situation there is improving, with construction jobs becoming fewer in the Territory, and that all the men needed for mining operations probably will be available this year. Members of the association, recently in Washington, D. C., discovered that federal authorities are becoming more sympathetic toward gold mining and are inclined to issue permits for a resumption of small operations in districts where there is a surplus of equipment and men are not needed for war purposes. Charles Johnston, president of the association, said he hoped for an easing of regulations soon, but he saw no large-scale resumption of operations.

▶ E. N. Patty, Chairman of the Alaska Committee of the Seattle Chamber of Commerce, proposed a revival of prospecting in Alaska in a recent address before the Alaska Miners Association. Several

of the 25 Alaska miners present offered suggestions calling attention to the fact that many young men in the armed forces now stationed in the Territory have indicated a desire to prospect after the war. Mr. Patty said in the past most of the prospecting has been done in the valleys and low hills and practically none in the higher hills and mountains above timber line. He said if the government will provide grubstakes the work would be greatly helped. Mr. Patty was formerly Dean of the School of Mines at the Alaska University, and he said the University will undoubtedly be crowded after the war.

▶ Lytle & Green Construction Co. was producing throughout the winter at its leased property, the Diamond coal mine, four miles from Healy. The coal comes from an 80-ft. seam. The product has been going to the Army, but Gus Parris, one of the owners of the mine, expects it to be available for the general market in the future.

▶ The following tax committee has been appointed by the Alaska Miners' Association at Seattle: Charles J. Johnston, Vernon Maxfield, Luther Hess, Harold Strandberg, Fred K. Dent, Gus Outila, G. A. Gustafson, R. E. Ogburn, James K. Crowdy, A. A. Shonbeck, Ralph Wyer, and E. N. Patty.

CANADA

Amalgamated Unions receiving more support—Silbak outlook poor—Tin found near Mayo

▶ In Ottawa G. A. Cheallen, of the Metal Controller's Office, recently announced that a decision had been made to sanction the release of production data. Figures for the years since 1940 are to be made public through the annual reports of operators. Authority has been given for publishing records of ore reserves that had previously been prohibited because of possible benefits to the enemy. Exceptions were made for tin, pitchblende, and the platinum metals, as well as figures on output relating to certain other strategic minerals.

▶ In April increasing opposition to the CIO position in organized labor was expressed by workers in several mining camps in Ontario, Manitoba, and British Columbia. This move took the form of strong support given to the Amalgamated Unions of Canada, an independent organization that functions under Provincial and Dominion laws and which assumes direct responsibility for all its actions relating to workers enrolled as members. Support has been given this union by employees of Consolidated Mining & Smelting Company of Canada at Trail, representing 5,100 workers, and the union has been requested to enter the camp at Kimberly, B. C. In Manitoba, the men at both Sherritt Gordon and Hudson Bay Mining & Smelting Co. have requested affiliation with this new organization. In

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I-T-E and the MINING FIELD

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Automatic Reclosing Circuit Breakers I-T-E automatic reclosing circuit breakers with load measuring characteristics are widely used in mines where d-c trolley and feeder systems are employed and where overload peaks and faults arise frequently. Type KSA is for substation use in protecting and controlling semi-automatic or full automatic M-G sets, rotary converters and mercury-arc rectifiers. Type KSC is used in sectionalizing service to localize faults. Sectionalizing provides for maximum production at reduced cost for power, for electrical maintenance and machine repairs.

Automatic Switchboards for Mines I-T-E has designed and built many switchboards in recent years for semi-automatic or full-automatic protection and control in connection with local generating systems or purchased energy. The switchboards are for service with M-G sets, rotary converters and mercury-arc rectifiers. Much of the equipment, including circuit breakers and protective relays, has been designed specifically for mining service. Mounting is simplified and there is much flexibility in space arrangements. A typical installation is at right below. (Fig. 4.)

Load Distributors I-T-E Type LDR Load Distributor improves service from two or more M-G sets or rotary converters in parallel on same system but widely separated. Generator loads are balanced to prevent over-heating, outages are reduced, peaks are limited and life of system and connected equipment prolonged.

Trolley-Wire Protector A rugged, manually operated circuit breaker protects 4–0 and 6–0 trolley wires, reducing fire hazards and preventing the annealing of wires.

Fig. 2

Fig. 1 *Type KB air circuit breaker for mining service, available for both a-c and d-c circuits.*

Fig. 2 (above) shows a Type KSA automatic reclosing circuit breaker for substation service. Fig. 3 (right) is a Type KSC automatic reclosing circuit breaker for sectionalizing service. Steel enclosure is open.

Fig. 3

Fig. 4

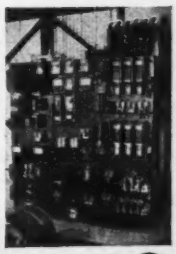

Fig. 5

Type LDR Load Distributor, panel mounted, in glass front, dust-proof cover.

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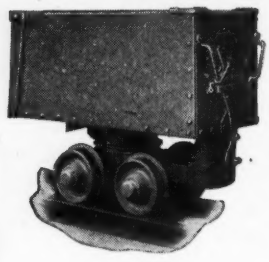

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Canada *(continued)*

the Little Long Lac camp of Ontario, employee associations at three of the mines have voted to shift their support to Amalgamated. Affiliation has also been declared at a recent meeting of employee committees of six of the mines at Kirkland Lake, Ontario.

▶ The Ontario Minister of Mines, L. M. Frost, recently pointed out the requirements for mine expansion in an address delivered before the Ottawa branch of the Canadian Institute of Mining and Metallurgy. He said that close cooperation could be utilized between the universities and various government departments to supply essential information to prospectors and to the industry. It was recommended that legislation be adopted to revise mining taxation so as to allow the Ontario royalty to be subtracted before deducting Dominion taxes, as well as providing for deductions from the Dominion tax to cover expenditures on outside exploration, and it was proposed that an allowance of 50 percent for depletion be allowed both the company and its shareholders. Reciprocal agreements were recommended for charging succession duties in only one Province, and it was recommended that security laws be revised to protect the public against fraud, while allowing greater latitude in mine financing.

QUEBEC

▶ Increased production and earnings are discussed in detail in the annual reports of Waite Amulet Mines and its subsidiary, Amulet Dufault Mines, and information on the output of essential wartime metals has been released for the first time since 1940. A spectacular increase in zinc is shown, with 1943 recovery amounting to 81,486,946 lb., compared with 23,123,712 lb. in 1941. Silver increased from 388,810 to 702,330 oz. in the same period. The 1940 gold output advanced from 11,881 to 14,483 oz. in 1943 and copper expanded in the same period from 40,765,824 to 49,441,774 lb. The mill treated an average grade of 4.15 percent Cu, 7.58 percent Zn, 0.036 oz. Au, and 1.71 oz. Au. Ore reserves in the Amulet Dufault section amounted to 2,872,322 tons in the Lower "A" and 141,100 tons in the Upper "A" orebodies. Stope diamond drilling amounted to 144,900 ft. J. Y. Murdock is president.

▶ New Malartic Gold Mines has purchased the property of Blouin Lake Gold Mines, north of the Sigma mine. Diamond drilling on this ground in 1937 was successful in locating the granodiorite-greenstone contact, which is known to be the critical ore control in this area. J. M. Forbes, mining engineer and director, has laid out a program for a magnetometer survey of the original property of New Malartic, between East Malartic Mines and Malartic Gold Fields.

▶ J. P. Norrie, consulting engineer, reports that a program of drilling has been drawn up for the property of West Shore Malartic Gold Mines for the purpose of testing a granodiorite structure that resembles the Siscoe "K" zone and is believed to be a northwest extension of that structure. It is also planned to test mineralized sections that were located a year ago. The property is at the south corner of Lake Malartic. Faulting has been noted which may be part of a continuous zone parallel to the main Cadillac fault. There is thought to be some promise of uncovering an ore structure within this area of faulting.

▶ An outline of postwar planning was recently given by H. L. Roscoe, vice president of Noranda Mines, who represents the mining industry on the Quebec Advisory Economic Council. Reference was made to the preparations being made for employment after the war is won, by various departments of the Dominion and Provincial governments. Plans were discussed dealing with the responsibility held by industry generally for expanding the opportunity for employment.

▶ In his annual report on Malartic Gold Fields, M. A. Thomson, president, stated that development has been confined in the past year to the No. 2 mine. This has resulted in reducing the reserve ore down to the 1,200-ft. level in the No. 1 mine to 534,040 tons. The shaft is being deepened to 1,650 ft. In the No. 2 mine above the 450-ft. level ore reserves amount to 895,845 tons, and development work to this depth has outlined four parallel orebodies as well as indicating several subsidiary lenses. This year it is planned to deepen the No. 2 shaft to 1,200 ft. where it would connect with the main haulage drive from the No. 1 shaft. It is planned to undertake a program of drilling from this drive. Dr. Robert Halet is mine manager and C. O. Stee is consulting engineer.

▶ At the annual meeting of Heva Cadillac Gold Mines approval was given the option agreement with Frobisher Exploration Co. affecting the group of claims located in Courville Township. Plans have been made for geophysical work and drilling on another Heva property in Louvicourt Township adjoining Obaska Lake Mines. Funds have also been provided for exploratory and development work on the large property in Joannes Township, on the main Cadillac regional fault. This latter ground adjoins Rouyn Merger Mines, Hosco Gold Mines, and a group of claims held by McIntyre Porcupine. J. J. Coghlan is president of Heva Cadillac.

▶ The intersection of ore values in deep drilling at Noranda Mines was discussed by J. Y. Murdock, president, in a statement dated April 10. A horizontal drill hole on the 5,975-ft. level between shafts No. 4 and No. 5 intersected 90 ft. of pyrite ore, of which the first 35 ft. assayed 0.4 percent copper and 0.12 oz. gold. The remaining 55 ft. carried 1.5 percent copper and 0.15 oz. gold per ton. A second hole was drilled under the first at a 45-deg. angle and cut 145 ft. of pyrite ore averaging 0.4 percent copper and 0.08 oz. gold across 50 ft. A second 50-ft. section averaged 1.0 percent copper and 0.2 oz. gold; and the remaining 45 ft. averaged 0.7 percent copper and 0.09 oz. gold per

...n. These intersections are stated to be the best grade and width to be secured below the 3,000-ft. level. Drilling is being continued.

▶Powell Rouyn Gold Mines has contracted with Pat Harrison, whose work was recently completed at Steep Rock Iron Mines, to deepen the shaft from 2,150 to 2,600 ft. Work started early in April. Diamond drilling has indicated an extension of the main orebody to the 2,350-ft. horizon, where the gold content is higher than in the mine workings. A 20-ft. intersection averaged $9.87, compared with about $4.50 as the average mine grade. A geophysical survey has been announced for the unexplored part of the Powell property. D. S. Johnston is mine manager and John C. Rogers is consulting engineer.

▶Indian Molybdenum, Ltd., subsidiary of Dome Mines, situated in Pressac Township, started milling last September and has given a satisfactory performance. The ore grade has proved to be lower than drill indications, although tonnage estimates have so far been confirmed. J. H. Stovel, general manager, reported that a tonnage in excess of the original design can be treated by the mill. The orebody has a 400-ft. length and a maximum width of 60 ft. The deposit has an average dip of about 40 deg. Loans to be repaid to Dome Mines amount to $813,514.

ONTARIO

▶Since last August, when the mill of Jerome Gold Mines was shut down, the shaft has been deepened to 1,100 ft. and an extensive development program started. Drifting is now in progress on the 500, 650, and 1,100-ft. levels and crosscutting is also to be done at the bottom level. The president, J. H. C. Waite, reports that a systematic test is being given the downward extension of the main ore zone. Exploratory drilling and crosscutting have been in progress in searching for parallel structures outside both the main and south zones. A 50-ft. ore section has been reported on the lower level grading 0.125 oz. gold across an average width of 4.2 ft. It is planned to reopen the mill when labor is available and government restrictions are removed, and also subject to a successful completion of the present development project. Ore reserves, when the mill was shut down, amounted to 213,442 tons having a gold content of 0.166 oz. per ton after deducting 10 percent for dilution

▶At the annual meeting of Falconbridge Nickel Co., increased ore reserves were reported, as well as a better working capital position and a higher rate of earnings. The president, J. Gordon Hardy, referred to contracts with the government for delivery of nickel to December 1945. As a result of the higher price that came into effect last September, a better earnings record is expected this year. With reference to labor problems, it was explained that the union committee had refused to accept terms similar to those adopted with International Nickel and had substituted an agreement that would mean a heavier burden to Falconbridge. The problem is receiving further discussion.

▶Extensive claim staking has taken place

Costs Reduced

A 20 h.p. Sauerman Slackline Cableway operating a small bucket on a 1,000 ft. track cable, reclaims tailing from dump in valley to bin on hillside above mill.

Sauerman Drag Scrapers handle indoor storage of coke, bauxite and pitch in three large storage buildings at aluminum refinery. Picture shows scraper at work inside coke storage building designed to hold 35,000 tons of coke.

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ON jobs where materials are to be moved distances of several hundred feet or more from pits, ponds, banks or stockpiles, a SAUERMAN Drag Scraper or Cableway is a great money-saver because it will dig, haul and place the materials without the help of other equipment.

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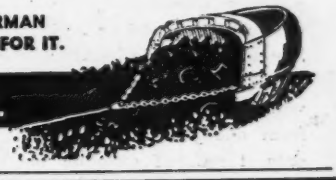

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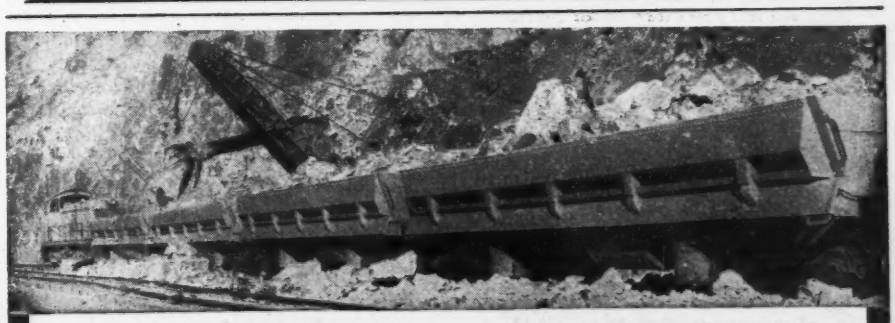

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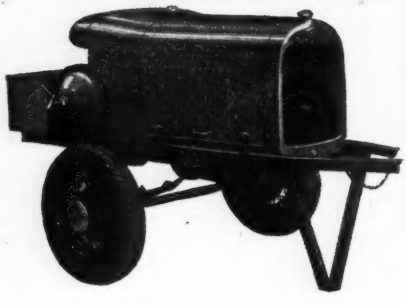

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Canada *(continued)*

in the area west from Kirkland Lake to Matachewan. The Warner property, comprising 900 acres bordering the north shore of Holmes Lake, has been optioned by American Metal Co. of Canada, and shallow drill holes are now being put down to explore a promising copper-gold deposit. This is the first property to be tested by the newly organized subsidiary of American Metal Co.

BRITISH COLUMBIA

▶ The session of the British Columbia Legislature just concluded adopted two legislative measures affecting the mining industry of this Province. The Petroleum and Natural Gas Act opens potential oil lands to exploitation by private companies. Locations under license or lease are limited to two square miles, and the Crown, in addition to collecting 12½ percent royalties, reserves adjacent acres for development by the government. The area in which prospecting for oil is to be permitted has been limited to 256,000 acres in the Peace River district of northeastern British Columbia. The Coal Act provides for the issue of both licenses and leases to develop and mine coal. The license limits the production of coal to a quantity not exceeding ten thousand tons. It is renewable from year to year. The lease provides for a tenure of 20 years and is renewable for successive periods of 20 years. It is granted only with respect to a location (one square mile in area) held under license and from which an output of 10,000 tons in a year has been achieved. The lessee covenants to produce not less than 10,000 tons of coal annually.

▶ During the fiscal year ended Dec. 31, 1943, Silbak Premier Mines, Ltd., Portland Canal mining division, produced 22,155 oz. gold and 342,454 oz. silver, valued at $910,410. Net operating profit after all expenses and write-offs was $229,108. Dividend payments aggregating 11c. per share and involving distribution of $275,000, necessitated a charge of $45,892 against reserve for depletion. Development work consisted of 3,219 ft. of diamond drilling and 1,196 ft. of drifting, crosscutting, and raising. Assured and probable ore reserves, broken and unbroken, were estimated on Dec. 31, 1943, at 118,706 tons, averaging 0.26 oz. gold and 2.76 oz. silver per ton. Shareholders have been advised by H. A. Guess, president, that the operation is in a precarious position for the following reasons: "(A) Ore breaking is not in sufficient volume to meet minimum mill requirements and hence the deficiency must be made up by withdrawals from that portion of the broken-ore reserve not held in shrinkage stopes; this portion at the present rate of encroachment would soon be exhausted. (B) Exploration and development crews are no longer of sufficient strength to open undeveloped orebodies at a rate commensurate with that at which presently worked orebodies are being exhausted, or to provide for the search for new ore structure. (C) shortage of trammers, combined with reduced stoping activity, makes increasingly difficult the maintaining of even the reduced tonnage now being treated in the mill."

▶ Privateer Mine, Ltd., which suspended gold-mining operations at its Zeballos property last fall as a result of the labor shortage, is active in the exploration field. A crew is at work on the Dome Mountain gold property, near Telkwa in the Omineca mining division, where particularly encouraging results have been obtained. One ore-shoot has been opened and both faces are in ore of commercial width and grade. A raise to the surface (about 100 ft.) has confirmed the vertical continuity of the vein. Privateer also has a crew at work on its group of Iceland Spar claims in the Kamloops mining division. It is hoped that improved methods and equipment will unearth more of this much needed mineral.

▶ Industrial Metals Mining Co., Ltd., recently incorporated with head office in Vancouver, is conducting an active campaign of exploration and development of the Little Billy and adjoining claims on Texada Island. Particularly favorable results have been obtained from diamond drilling and drifting on the 180-level of the Little Billy, where a copper-gold orebody of commercial size and value has been indicated. The old Copper Queen shaft is being dewatered and reconditioned to permit underground exploration in that property. This group of properties was productive of shipments of copper ore valued at more than eight million dollars in the early days of the century.

▶ During the fiscal year ended Dec. 31, 1943, Bralorne Mines, Ltd., Lillooet mining division, produced 62,654 oz. gold in bullion and 10,311 oz. in concentrate from 118,462 tons, averaging 0.632 oz. gold per ton. Revenue from recovery was $2,759,958. Operating costs, including shipping and community welfare services, aggregated $908,706. Write-offs include $54,000 for depletion, $78,000 for depreciation, and $409,350 for taxes. Net operating profit was $1,269,245. Dividend disbursements were $1,496,400 ($1.20 per share) and advances to subsidiary companies for expenditures on outside properties were $378,233. Concerning the Takla mercury property, Ira B. Joralemon, consulting geologist, states: "Since the first of 1944 serious troubles, except those due to labor shortage, have been overcome. The capacity of the furnace has been proved to be well above the original estimate, and metallurgical efficiency is excellent. Reserves of developed and possible ore are sufficient for several years if the price continues at approximately the contract level ($187.60 per flask)." Summit King Mines, Ltd., the Nevada subsidiary, was idle throughout the year save for the examination of strategic-metal properties. In view of revised United States tax laws application has been made for a refund of a portion of the relatively large taxes paid before the shutdown.

▶ March production of the Cariboo Gold Quartz Mining Co., Ltd., was valued at $63,525. Recovery was made from 3,416 tons of ore milled.

▶ The Granby Consolidated Mining, Smelting & Power Co., Ltd., Similkameen

THE Hard-Facing ANALYZER

THIS MONTH'S WEAR PROBLEM:
TRACTOR ROLLERS

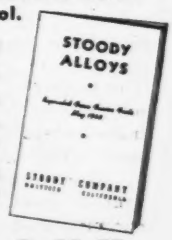
SELECTING the proper hardfacing alloy for any job must always be based upon operating conditions, which vary infinitely between applications. Tractor Rollers, for example, must withstand:

IMPACT of rails against rollers.
ABRASION of earth between metal parts.

STOODY SELF-HARDENING is the pick of the 12 Stoody alloys for hardfacing tractor rollers. It's tough enough to take the jarring impact of heavy rails on the rollers without chipping or spalling, and the high-alloy content provides the extra wear resistance to combat earth abrasion. Wear resistance is so great, in fact, tractor rollers hard-faced with Stoody Self-Hardening outwear by two to one the best high carbon that can be applied! Because of Stoody Self-Hardening's low coefficient of friction, actually less wear occurs between roller and rails than with steel-to-steel contact.

In addition, Stoody Self-Hardening is easy and fast to apply, is very dense and can be readily peened to shape. An expert welder can apply this alloy so smoothly that grinding after hardfacing is unnecessary.

HARD-FACING PROCEDURE:

Stoody Self-Hardening can be applied to tractor rollers either of two ways: (1) A bead run around the outer edge and space between the bead and collar filled in with horizontal welds or (2) A bead around the outer edge to bring the roller back to diameter, and intervening area between outer edge and collar filled with a series of circumferential beads of hard metal. Either method is equally successful but the latter has the advantage of more easily maintaining roller concentricity. Rollers with integral bearing assemblies are best hardfaced immersed in a tank with circulating water to keep bearings cool.

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Canada *(continued)*

mining division, produced copper, gold, and silver valued at $3,907,398 during the fiscal year ended Dec. 31, 1943. After all operating expense and provisions of $25,153 for depletion, $260,685 for depreciation, and $88,257 for taxes, a net profit of $124,184, equivalent to 28c. per share, was realized. Distribution of $202,605 was made by payment of three dividends of 15c. per share each. Surplus as of Dec. 31, 1943, stood at $1,164,803. Development work consisted of 5,945 ft. of drifting and crosscutting, 9,196 ft. of raising, 5 ft. of sinking, and 7,255 ft. of diamond drilling. Ore reserves were estimated at the year-end at 17,341,453 tons. Julian B. Beaty, president, states: "The agreement with Metals Reserve Co. remained in effect throughout the year expiring on Dec. 31, 1943. Since that date, additional tonnages equivalent to our current production have been sold to the U. S. Commercial Co. for delivery during the first half of this year. Thereafter, unless other arrangements are made, shipments will be resumed to the American Smelting & Refining Co. at Tacoma, Wash., under our contract with that company, which has been suspended since Nov. 1, 1942."

▶ The 150-ton mill of Reco Mountain Base Metals Mining Co., Ltd., situated on the Noble Five property in the Slocan mining division, was destroyed by fire April 17. Loss is estimated in excess of $80,000.

▶ The value of production of Base Metals Mining Corp., Ltd., Golden mining division, for the fiscal year ended Dec. 31, 1943, was $436,989. After all operating expense and provision of $77,714 for deferred development, $5,895 for depreciation, $1,013 for sundry accounts, and $12,435 for taxes, net profit for the year was $13,867. Development work consisted of 463 ft. of drifting, 204 ft. of raising, and 1,429 ft. of diamond drilling. Estimated reserves of proved and probable ore at the end of the year were 27,500 tons, averaging 5 percent lead and 8.5 percent zinc. There remains favourable ground to be developed in the Kicking Horse mine. On Jan. 2, 1944, the power house was destroyed by fire, necessitating the complete cessation of operations. The plant was fully covered by insurance, and orders have been issued for replacements and repair parts. It is hoped to resume milling by June.

▶ The International Union of Mine, Mill and Smelter Workers on April 18 asked the National War Labor Board for a revised and stabilized contract regarding wages for approximately 1,500 employees of Consolidated Mining & Smelting Co. of Canada, Ltd., at the Sullivan mine and concentrator. The workers made the following five requests: (1) Stabilization of wages for 450 miners at $8.02 per day in place of a "complex and arbitrary" wage structure with bonuses supplementing a fixed rate of $4.50 per day. (2) Adjustment of wages for all non-miner employees, except supervisory and office staffs, to maintain differentials with the miners' rates. (3) Payments of time and one-half for overtime after eight hours a day or 48 hours a week, double time for statutory holidays, and payment of a minimum of one-half shift to workers called out between shifts. (4) Vacations with pay varying from six days after one year's employment to 12 days after eight years'. (5) A shift bonus of 5c. for workers on shifts starting between 3 p. m. and 7 a. m. The union was represented by Harry Nicholson, secretary of the Kimberley local; Harvey Murphy, international representative, and John Stanton, union counsel. The Consolidated company was represented by S. G. Blaylock, chairman and president; A. C. Johanson and M. H. Mason, counsel; E. W. Campbell, personnel director, and J. R. Geigerich, mine superintendent.

YUKON TERRITORY

▶ Gold production in the calendar year 1943 was 53,731 oz. acording to a recent statement by G. A. Jeckell, Territorial Controller. In the Dawson district, Yukon Consolidated Gold Corp., Ltd., operated five dredges during the season. These were on Quartz, Dominion, Hunker, and Bonanza creeks and on the Klondike River. The season was favourable for dredging. Total ground dredged was 6,867,614 cu.yd., and gross returns from recovery were $1,329,350. The maximum number of men employed was 197 in April, of whom 64 were retained over the winter. Some stripping was done on Middle Dominion creek, but owing to the shortage of labor, no thawing plants were put into operation. Clear Creek Placers, Ltd., operated one dredge on the left fork of Clear Creek with satisfactory results. There were the usual number of individuals working during the open season, either on their own claims or working lays on ground owned by mining companies. Mr. Jeckell states: "One of the most interesting finds of the year in Yukon was the discovery of cassiterite in bedrock in the Dublin Gulch area of the Mayo district. In 1940, cassiterite was discovered in Dublin Gulch placers and late in August, 1943, it was found by panning in the soil of a hillside on the north side of the gulch. An open-cut excavation across the face of the hill exposed cassiterite vein-material in a loose condition but virtually in place."

▶ Completion of the 600-mile telephone line from Norman wells to Whitehorse, which is expected to facilitate mine and oil operations materially, has been announced by Brig. Gen. Ludson D. Worsham, commanding general of the Northwest Service. This is the last link in the Northwest telephone system. It follows the announcement that the pipeline to the refinery at Whitehorse has been completed. The lines are parallel for most of the distance. This makes possible direct telephone conversation from the Yukon to Washington, D. C.

▶ Yukon Consolidated Gold Mining Corp. expects to have three of its nine large dredges in operation this season in the Klondike area, according to MacLeod White, assistant manager. One is on Bonanza Creek, one in the Klondike Valley and one on Quartz Creek.

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Material handling is a major problem with industry today because of acute manpower shortages. Here's a typical solution, proved in many enterprises:

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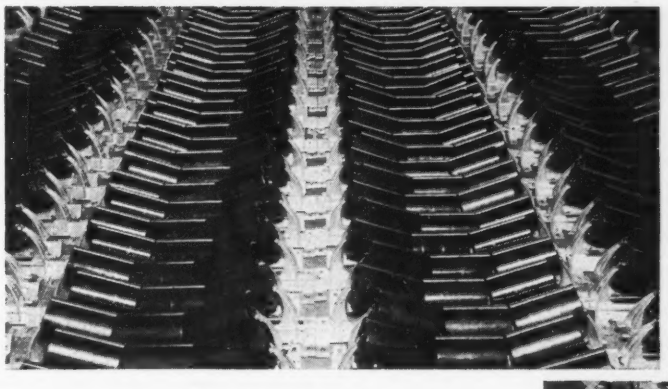

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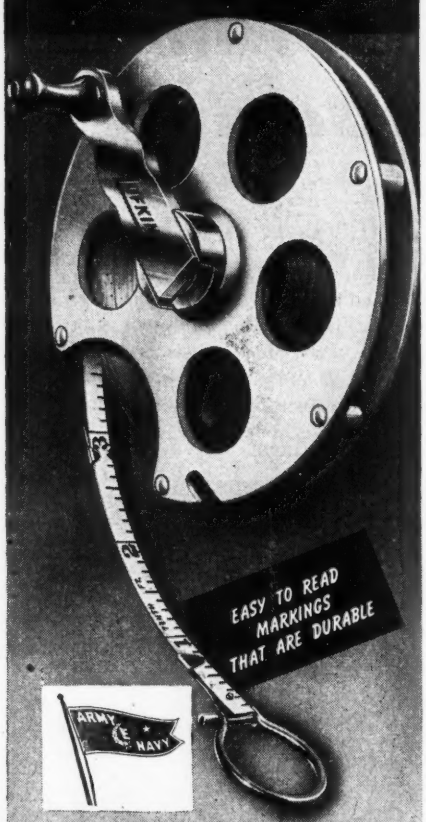

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MEXICO

Government plans aid to mercury miners—Machinery prices rise—Dos Azules wins suit

▶ Decreasing prices of mercury and the threat of keen postwar competition from Spanish mines have impelled the Mexican government to attempt to protect Mexico's mercury mining industry. It is reported in official circles that these protective measures will include the lifting of certain export taxes on mercury, improved export facilities for the metal, and increased aid to prospectors, particularly in Guerrero. Opinion on the question of Spain's threat to local mercury miners is divided. It is reported that Spanish mines in the Almaden district have access to ore yielding about four times as much mercury per ton as do the best of the Mexican ores. Some men believe that the government aid and the nearness of Mexican mines to U. S. markets will combine to offset the advantage of the high-grade Spanish mines.

▶ It is reported that Mineral Moris, once one of the richest producers of gold and silver in Chihuahua, has been shut down because of the exhaustion of the high-grade ore that alone made operations profitable.

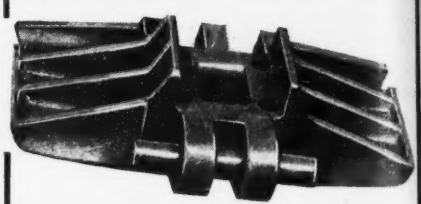
▶ Optimism now characterizes members of the cooperative society that took over some years ago the operations of the French-owned Cia. Minera Dos Estrellas, S. A., at El Oro, Mexico, and Tlalpujahua, Michoacan. The new administrative committee of the cooperative has promised the members that operating economies that will soon be put into effect will improve the financial position of the group.

▶ The strike now tying up the Mexican Telephone Co., which with the Ericsson Co., a Swedish enterprise, supplies all Mexico's telephone service, is greatly inconveniencing mining and all other industry in Mexico. The workers at first demanded a 35 percent wage increase, and then reduced their demands to 16 percent, but have steadfastly refused to accept the company's offer of a 9.5 percent raise. The strike began March 13. The Mexican company has about 80,000 subscribers in Mexico, and at present the Ericsson local and long distance lines are greatly overcrowded.

▶ Difficulty in obtaining machinery and spare parts is beginning to pinch many of Mexico's smaller mining companies, as well as some large independent operators. Prices of used mining machinery and spare parts in Mexico are now so high that they might as well be considered luxury articles. The Mexican government is said to be doing all it can to correct this situation. The larger companies are not yet so seriously affected by this condition.

▶ Contending that it is now left with only low-grade ore that is unprofitable to work, Cia. Minera La Chiripa, S. A., operating in southern Sinaloa, has asked the federal board of conciliation and arbitration for permission to suspend operations. The company told the board that

ORO SUPERMANG
SHOVEL TREADS
Reduce Operating Costs



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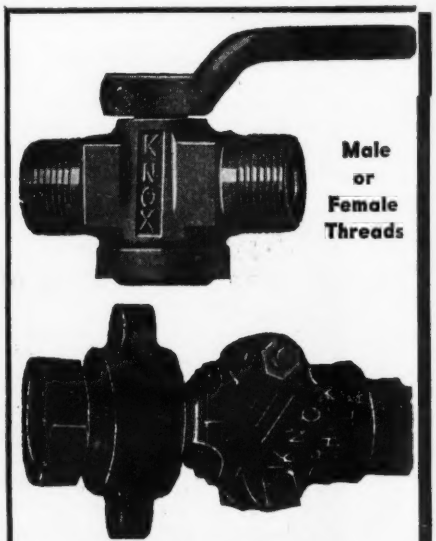

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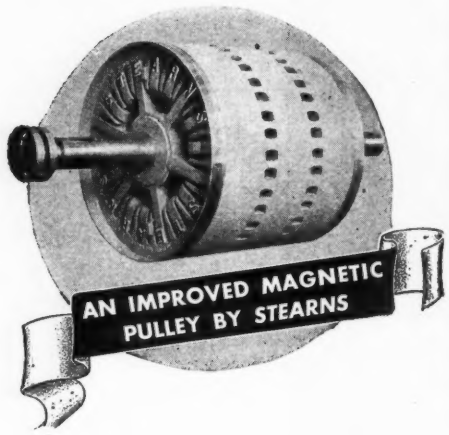

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We will be glad to test your material, 25 to 50 lbs. prepaid for analysis and recommendation.

STEARNS MAGNETIC MANUFACTURING CO.

624 S. 28th St. Milwaukee, Wis.

Mexico *(continued)*

it has operated at a loss for several months and that its employees have rejected all its proposals to reduce personnel in order to maintain operations.

► Cia. Minera Dos Azules, S. A., Zacatecas, recently won a ruling from the Supreme Court in a suit brought by a prospector, Teofilo Vargas, who had been injured by a fall of rock while he was working on the company property. The court held that men who are allowed by mining companies to do free-lance work on their properties are not entitled under the labor law for indemnification for injuries suffered in the course of such work.

AUSTRALIA

Electrolytic Zinc Co. showed a profit last year—Last Victoria tailing plant closes

WESTERN AUSTRALIA

► The report for the Department of Mines for the year 1942, which has recently been issued, gives the quantity of gold reported by producers as 845,772 oz., which was a decrease of 259,755 oz. in comparison with 1941. Tonnage treated was 3,225,704 tons, or 1,066,005 tons less than in 1940, in which year a record tonnage was produced. Dividends paid by mining companies during the year amounted to £A423,712, which was a decrease of £A406,320 compared with the previous year's record. To the end of 1942 the total amount distributed by gold-mining companies in dividends was £A39,839,903. To the same date the value of the mineral production of the State amounted to £A225,070,963, of which gold accounted for £A207,019,690 based on normal values; but premiums on the sale of gold during 1920-24 and since 1930, and payments under the Gold Bounty Act of 1930, increased the total value of gold and mineral production by £A53,817,226. The calculated average value per ton of ore treated in the State as a whole declined from 22.30s. per ton in 1941 to 22.27s. per ton in 1942, based on gold at £4-4-11.45 per ounce, but the average premium obtained for gold during the 12 months, 146.07 percent, would more than double the estimate. On the basis of gold £4-4-11.45 per oz., the average returns per ton of ore treated on the more important mining fields, for the years 1940, 1941 and 1942, were:

	1940, Shillings per Ton	1941, Shillings per Ton	1942, Shillings per Ton
East Murchison...	15.78	14.18	12.93
Mount Margaret ..	29.83	31.39	31.45
Murchison	15.73	15.13	15.32
Dundas	22.41	28.54	30.66
East Coolgardie ...	——	24.11	25.70

The East Coolgardie gold field, which includes the mines of Coolgardie and the big groups of Kalgoorlie and the Golden

PAN-AMERICAN JIGS

ARE DOING a Big Job these days by getting the most from

STRATEGIC MINERALS

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If you are not working PAN-AMERICAN JIGS in the vital job of producing more for the War Effort we suggest that you inquire by letter or cable as to how you may raise your output of these valuable minerals with PAN-AMERICAN JIGS.

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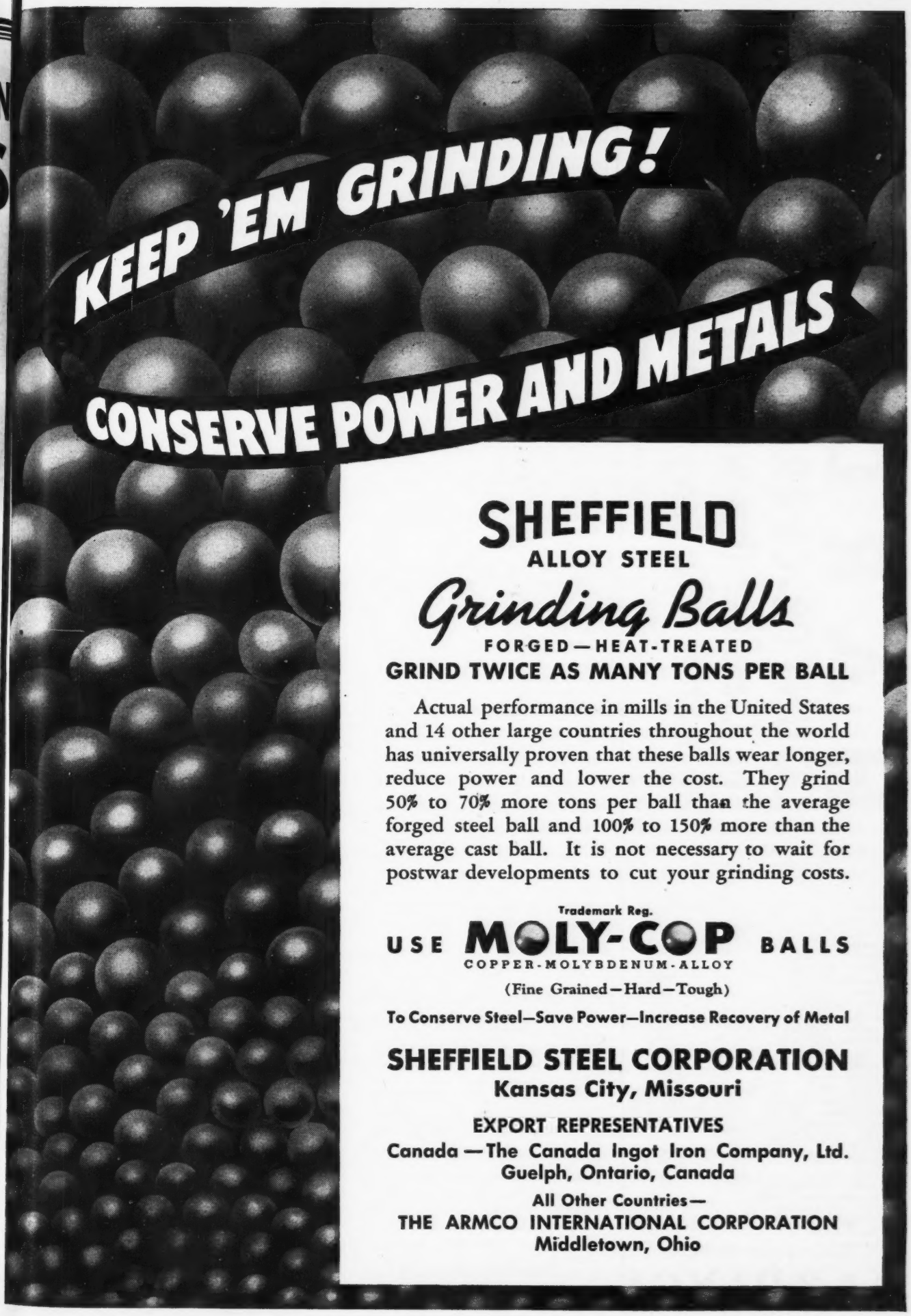

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ALLOY STEEL
Grinding Balls
FORGED—HEAT-TREATED

GRIND TWICE AS MANY TONS PER BALL

Actual performance in mills in the United States and 14 other large countries throughout the world has universally proven that these balls wear longer, reduce power and lower the cost. They grind 50% to 70% more tons per ball than the average forged steel ball and 100% to 150% more than the average cast ball. It is not necessary to wait for postwar developments to cut your grinding costs.

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USE MOLY-COP BALLS

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(Fine Grained—Hard—Tough)

To Conserve Steel—Save Power—Increase Recovery of Metal

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Kansas City, Missouri

EXPORT REPRESENTATIVES

Canada—The Canada Ingot Iron Company, Ltd.
Guelph, Ontario, Canada

All Other Countries—
THE ARMCO INTERNATIONAL CORPORATION
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HARDINGE
COUNTER-CURRENT CLASSIFIERS
The Classifier that will start under full load no matter how long it has been shut down
Write for Bulletin 39-A

Other Hardinge Equipment

	Bulletin No.
Agitators	31-C
Clarifiers	31-C
Classifiers, Air	17-B
Classifiers, Counter-Current	39-A
Classifiers, Hydro	31-C
Density Stabilizer	42
Digesters	36
Dryers	16-C
"Electric Ear"	42
Feeders, Belt	33-C
Feeders, Constant Weight	33-C
Feeders, Disc	33-C
Feeders, Drum	33-C
Feeders, Non-Flooding	33-C
"Feedometers"	43
Filters, Sand	30-A
Metal Reclamation	8-A
Mills, Batch	19-A
Mills, Conical Ball	13-D
Mills, Conical Pebble	13-D
Mills, Rod	25-A
Mills, Tube	18
Mixers, Slurry	31-C
Pumps, Diaphragm	32
"Ruggles-Coles" Dryers	16-C
Kilns and Coolers	16-C
Scrubbers, Conical	37
"Thermomill"	17-B
Thickeners	31-C

HARDINGE
COMPANY, INCORPORATED - YORK, PENNSYLVANIA
NEW YORK, CHICAGO, SAN FRANCISCO, TORONTO

Australia *(continued)*

Mile, produced approximately 50.32 percent of the State's total output of gold for the year. The estimated value of gold produced in the State was 93.44 percent of that of the total mineral production. Of other minerals, coal, arsenic, and antimony were next in importance.

TASMANIA

► Electrolytic Zinc Co. of Australasia, Ltd., which operates an electrolytic zinc works at Risdon, near Hobart, and silver-lead-zinc mines at Rosebery and Mount Read, on the west coast of the island, earned a net profit of £A292,765 in the year which ended on June 30, 1943. The greater part of the company's concentrates are obtained from the mines at Broken Hill, New South Wales, one-third coming from the company's own mines in Tasmania. Cheap hydro-electric power is available, which was a deciding factor in placing the works in Tasmania when the company was formed in 1916.

The conduct of operations has been faced with difficulties due to increases in wages and the introduction of wartime allowances, lower operating efficiency under wartime conditions, advances in the price of stores, and the fact that the sale of products in Australia is controlled at a fixed price which does not compensate for the increased cost of production. In compliance with government regulations, operating statistics have not been disclosed. The fixed price for high-grade zinc in Australia is £22 per ton; the price in Great Britain, delivered into buyers' works, is equivalent to £34 per ton Australian currency, whereas that of electrolytic zinc in the U. S. A. is the equivalent of £64 per ton. Superphosphate is produced in Tasmania by the company in sufficient quantity for agricultural requirements of the island. It is the intention of the company to complete the extension of the electrolytic zinc plant, which is at present the third largest in the world.

Referring to taxation at the annual meeting, it was stated that the abnormally high rates did not permit many companies to build up reserves to preserve their stability and to carry them over difficult postwar periods.

VICTORIA

► Maryborough Gold, N. L., is the last of the companies engaged in the re-treatment of auriferous slum dumps resulting from earlier deep lead-mining operations to cease work due to difficulties arising from manpower restrictions. The dumps are separated by distances of from one to two miles and the dump material, after breaking down with nozzles, in the course of which it is pulped with cyanide solution, is pumped to a central treatment plant, the ultimate process being thickening, agitation, vacuum filtration, and Merrill-Crowe precipitation. To the time of closing down, 396,245 short tons of slum, which is equivalent to slime of ore-dressing operations, and contains gold in a very fine state of division, had been treated for the recovery of 9,646 oz. of gold.

ROSS FEEDER
Completely Controls
the flow of any size material from Storage Bins, Hoppers or Open-Dump Chutes to Crushers, Conveyors, Screens, etc.
High in efficiency. Low in maintenance and power consumption.
Furnished in sizes to suit your operation. Scalping unit to fit your chute if desired. Send full particulars for recommendation.
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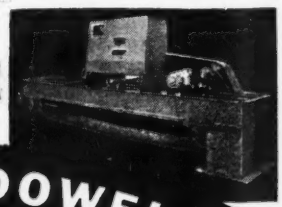
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FEEDS MATERIALS *automatically* BY WEIGHT
Where control of feed improves efficiency—as in weighing feed of ores to ball mills—the Merrick FEEDOWEIGHT gives perfect results. Weighs and Regulates separately. Continuously totalizes weight. Gives better control of grind. Used and approved by leading mill properties. Simple—rugged—"foolproof."
FOR BETTER CONTROL
BULLETIN 551 FOR DATA
MERRICK SCALE MFG. CO.
PASSAIC, NEW JERSEY, U. S. A.

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New Mack Trucks for Civilian Pool:

Because of urgent and mounting essential civilian needs, the War Production Board has authorized the manufacture of certain types of trucks for commercial use.

Assigned to Mack are models ranging from 9,000 pounds gross vehicle weight up to the largest off-highway vehicle. Production on some models has already started.

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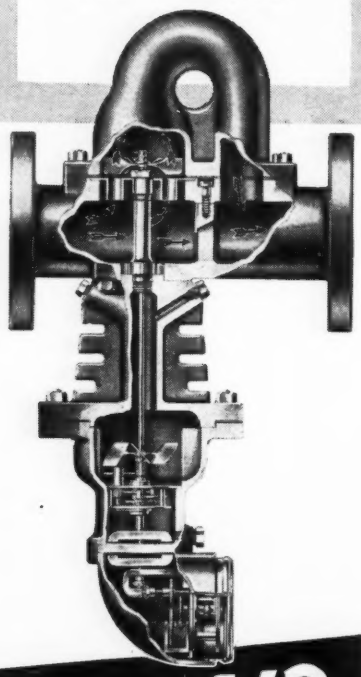

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Bulletin No. 349 on request. Address Builders-Providence, Inc., 55 Codding St., Providence, R. I

Sincerely Yours.
BUILDERS - PROVIDENCE

(Continued from page 96)

POSTWAR TAX POLICY AND BUSINESS EXPANSION. By Lewis H. Kimmel. Published by the Brookings Institution, Washington 6, D. C. Pp. 46. Price 50c.

Calling attention to the need for remodeling our tax structure in the post-war period in order to enable business to create full employment, this concise study makes several recommenations to accomplish this. The writer is against continuation of the excess-profits tax beyond the war period and favors gradual reduction of the corporate normal tax to rates within the range 5 to 10 percent. He urges a universal right to make consolidated returns, no penalties on inter-corporate income, special consideration for bona fide new industry, a four-year carryover for losses, liberalization of depreciation provisions, and repeal of the capital-stock tax.

In the field of individual income taxes he recommends more favor toward returns on equity capital, and a liberal policy with respect to capital gains and losses, and abandonment of the present double taxation of corporate earnings distributed s dividends.

POSTWAR RE-EMPLOYMENT. Thc magnitude of the problem. By Karl T. Schlotterbeck. The Brookings Institution, Washington 6, D. C. Pp. 27. Price 25c.

This analysis of the postwar employment problem is on the optimistic side. Calling attention to the fact that demobilization of the armed forces is bound to be gradual and will begin as soon as the European phase of the war is over, the conclusion is that during the transition period enough people will be unavailable for the labor force to make the job situation relatively easy. This conclusion learns heavily on the assumption that the great backlog of unfilled consumer needs that now exists will call for a high level of industrial production.

PUBLICATIONS RECEIVED

French Equatorial Africa. Bulletin No. 1 of the Service des Mines, issued at Brazzaville, contains a geological sketch of the country, in two parts, totaling 96 pp. A geological map of the country (scale, 1 in-3,500,000) accompanies it.

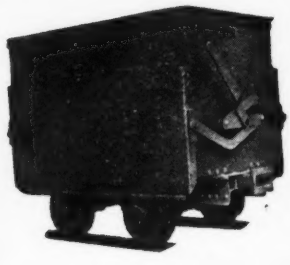
Buteux Area, Abitibi County and **Abitibi Territory, Quebec,** Geological Report 16. Division of Geological Surveys, Quebec, P. Q. Pp. 17, plus map.

Mining Industry of Quebec, 1942. Department of Mines, Quebec, P. Q. Pp. 119.

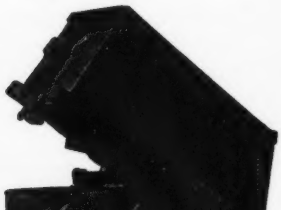
British Guiana. "Geology, Gold and Diamond Deposits of the Awarapari-Issineru-Putareng Area, Upper Mazaruni River." By D. A. Bryn Davies. Bulletin 17, 1939, Pages 30, plus maps and photograph supplement. Price 48c. (local currency). Also Bulletin No. 19, 1938, on "Area Between Arakaka and Kokerit, Northwest District," by S. Bracewell. Pp. 32, plus maps. Price 24c.

CARD CARS

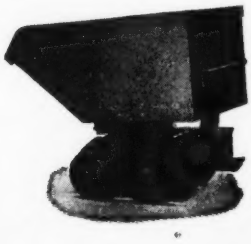
A ♠ . . . for "Lowest Cost Per Ton Mile Haul".



A ♦ Card designs cars to meet each mine's individual conditions.



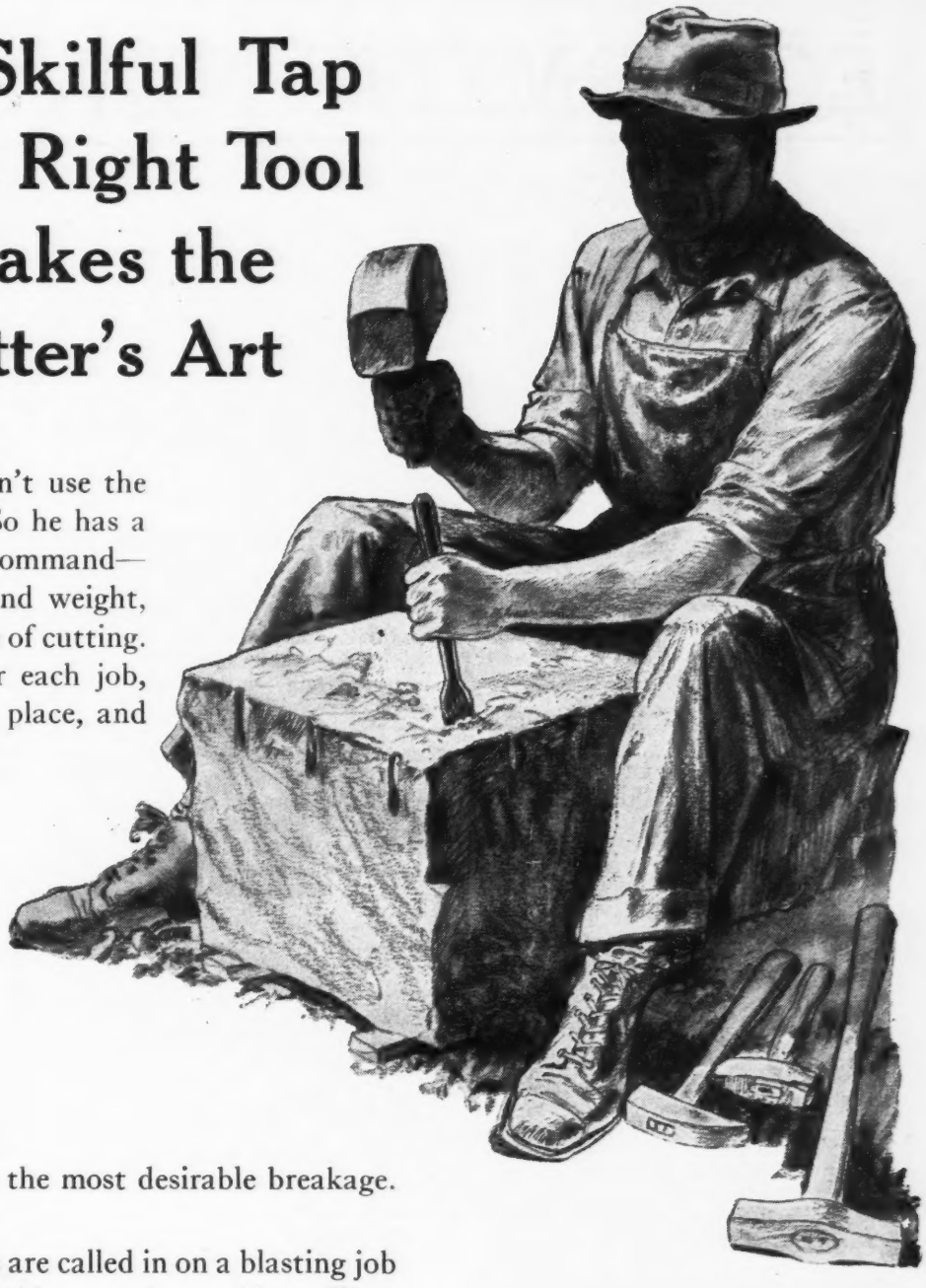
A ♣ May we help on your own car problems?



Ask for Catalog 40 ♣ A

C S Card Iron Works Co
Denver, Colorado

It's the Skilful Tap With the Right Tool That Makes the Stonecutter's Art



THE stonecutter doesn't use the same hammer on all jobs. So he has a number of hammers at his command—each of a different shape and weight, each made for a specific type of cutting. Using the *right* hammer for each job, hitting in exactly the right place, and with just the right force, the stone is cut precisely as the stonecutter wants it.

In blasting likewise you cannot use the same tool for every job and get good results each time. It takes the *right* explosive, used by the right method—with the right force, at the right place—to produce the most desirable breakage.

When Atlas Representatives are called in on a blasting job they apply synergistic* thinking to the problem. They study every detail, swap ideas with the blasting men. From this comes a specific recommendation: The *one explosive*, the *one blasting method*, that will produce the utmost in fragmentation.

***Synergism:** *The force that produces "2 + 2 = 5" results when you and we get together and really "click."*

For "2 plus 2 equals 5" blasting results, consult Atlas.

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CHEMICALS ATLAS EXPLOSIVES

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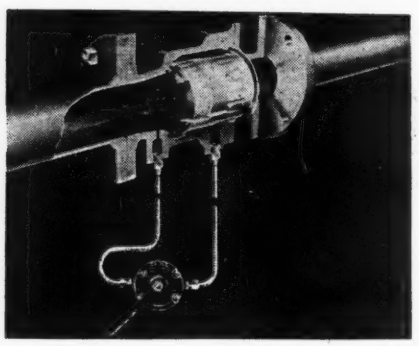
EQUIPMENT NEWS

Remote-Control Valve

The Grove Flexflo remote-control valve, shown herewith, represents a departure from conventional valve types in design, construction, and operation. In contrast to mechanically operated valves, the Grove valve operates by manual or automatic remote control on the hydraulic principle of balanced and unbalanced fluid line pressure. The manufacturer states that no more external force is required to open or close a Grove 24-in. valve than a 1¼-in. valve.

The valves are designed for cold-fluid service, and because the valve's one operating part is non-metallic, they are said to be resistant to corrosion, erosion, and



electrolytic action. Their capacity is said to be considerably greater than globe-type valves on the same pressure drop or less.

Position of the valve is controlled by the smaller valve, which can be placed at some distance from the main valve. When the remote valve is closed, line pressure holds a flexible sleeve in the main valve open. When the remote valve is opened, the line pressure is diverted into an actuating chamber in the main valve, and the flexible sleeve is thereby closed over a solid core, sealing off the pipe. Static line pressure maintains the closed position until the remote valve is again closed.

Full details concerning uses of this valve in remote controlled and automatic installations are given in Bulletin 800 of Grove Regulator Co., 6477 Green St., Oakland 8, Calif.

New Vibrating Screen Deck Suspension

A new tensioning principle is employed in the design of the desk suspension now made available by Allis-Chalmers on the Low-Head, Aero-Vibe, and Ripl-Flo vibrating screens. Transverse arching of the screen surface is said by the manufacturer to be eliminated by the end-tension applied to the screen, and the result is an even bed depth of material all across the screen.

A distributing plate at the feed end reduces screen wear by providing even flow of material across the screen width. Sections of the screen can be turned end for end and upside down to increase screen life. The feed end of each section can be furnished with a blank surface, if desired, to give a pool-washing effect. Further information on the end-tension deck can be obtained from Allis-Chalmers Mfg. Co., Milwaukee 1, Wis. Ask for Bulletin B-6321.

Belt-Repair Compound

Designed for repairing breaks, burnt or worn spots, and for resurfacing belts of all kinds, Industrial So-Lo, the product of So-Lo Works, Inc., Loveland, Ohio, is now being made with synthetic rubber. The manufacturer reports that this new form increases the product's resistance to oil and grease, decreases its shrinkage, allows it to spread more easily and dry more smoothly. The product is also said to serve as an insulator for covering switch handles, as a protective coating, and for repair of rubber boots and gloves.

Heavy-Duty Switch

Specifically designed for underground haulage signal systems, the new heavy-duty signal switch offered by Mosebach Electric & Supply Co., Pittsburgh 3, Pa., has the added advantage, according to the manufacturer, of giving warning of existing danger. The switch is wired in series with the signal lights so that if one light fails, the entire system fails. The unit is said to be built for rough usage and to be easy to install. It can be operated without leaving either motor or trip.

Water Treatment Plants

Announcement is made by The Dorr Co., New York 22, N. Y., that it is prepared to design and install systems for the complete de-mineralization of water, or for a "tailor-made" water of any specified quality for numerous applications in industrial processes. Suggested applications are: removal of simple hardness; reduction of bicarbonate alkalinity; reduction of total solids; and metal recovery from trade wastes. Further details may be obtained from the company.

INDUSTRIAL NOTES

J. S. Hazen is now associated with **Worthington Pump & Machinery Co.**, Holyoke, Mass., as manager of the mining drill division.

Marion Steam Shovel Co., Marion, Ohio, announces the appointment of **L. C. Mosley** as manager of the mining division, a position left vacant by the recent death of Homer Littlefield.

H. H. Buchanan, formerly assistant general sales manager for **Thew Shovel Co.**, Lorain, Ohio, has been appointed general sales manager for **La Plant-Choate Mfg. Co., Inc.**, Cedar Rapids, Iowa. He succeeds **H. N. Graves,** who resigned last June.

Edward J. Herzog has been appointed manager of the oil and mining industries division of **Westinghouse Electric International Co.**, New York, N. Y.

A. W. Dale, of **Gardner-Denver Co.**, Quincy, Ill., has been appointed assistant to **R. H. Pearson,** vice president of the company. Mr. Dale has for the past 12 years been managing director of **Gardner-Denver Africa, Pty., Ltd.**, the South African branch of the company. He will be succeeded in that position by **Paul Lagerquist,** former Gardner-Denver representative in Australia.

LaPlant-Choate Mfg. Co., Cedar Rapids, Iowa, has opened a sales office in the International Building, Rockefeller Center, New York City, to be in charge of **Jay Fetters,** formerly London manager for Caterpillar Tractor Co.

BULLETINS

Mine Cars. The entire line of coal mine cars built by Pressed Steel Car Co., Inc., Pittsburgh, Pa., is described in a catalog, No. 72-H, just published.

Air Compressors. A new 56-page bulletin is offered by Sullivan Machinery Co., Michigan City, Ind., describing its line of heavy-duty two-stage air-cooled compressors for industrial plants, mines, and heavy contracting.

Welding Apparatus. Victor Equipment Co., 844 Folsom St., San Francisco, Calif., has prepared an excellent bulletin showing the company's complete line of gas-welding and -cutting apparatus. Ask for Form 20.

Power Centers. Compact coordinated unit substations, available in all standard ratings, are discussed in a 25-page booklet, B-3224, prepared by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Trucking Handbook. All bona-fide owners, operators, and mechanics working with Euclid equipment are invited to write for the Euclid Operators' Handbook, which deals with proper care and maintenance of Euclid trucks. Because of the high cost and special nature of this book, the Euclid Road Machinery Co., Cleveland, 17, Ohio, does not intend it for general distribution.

V-Belts. A most comprehensive collection of data on every aspect of V-belt design and installation is offered by Dayton Rubber Mfg. Co., Dayton, Ohio, in the form of a pocket-size, 384-page catalog, No. 280, on V-belt drives.

Chain Drive Calculations. A series of tables that gives accurate results in determining center distances and chain lengths of chain drives operating over cut-tooth wheels is contained in booklet No. 1991, available without charge from Link-Belt Co., Chicago, Ill., or any other office of the company.